Compress

MARCH 1950

PERMANENT FILE

LITERATURE

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X-1850 2M 10-54

BALE OF HAY GETS A BOOST

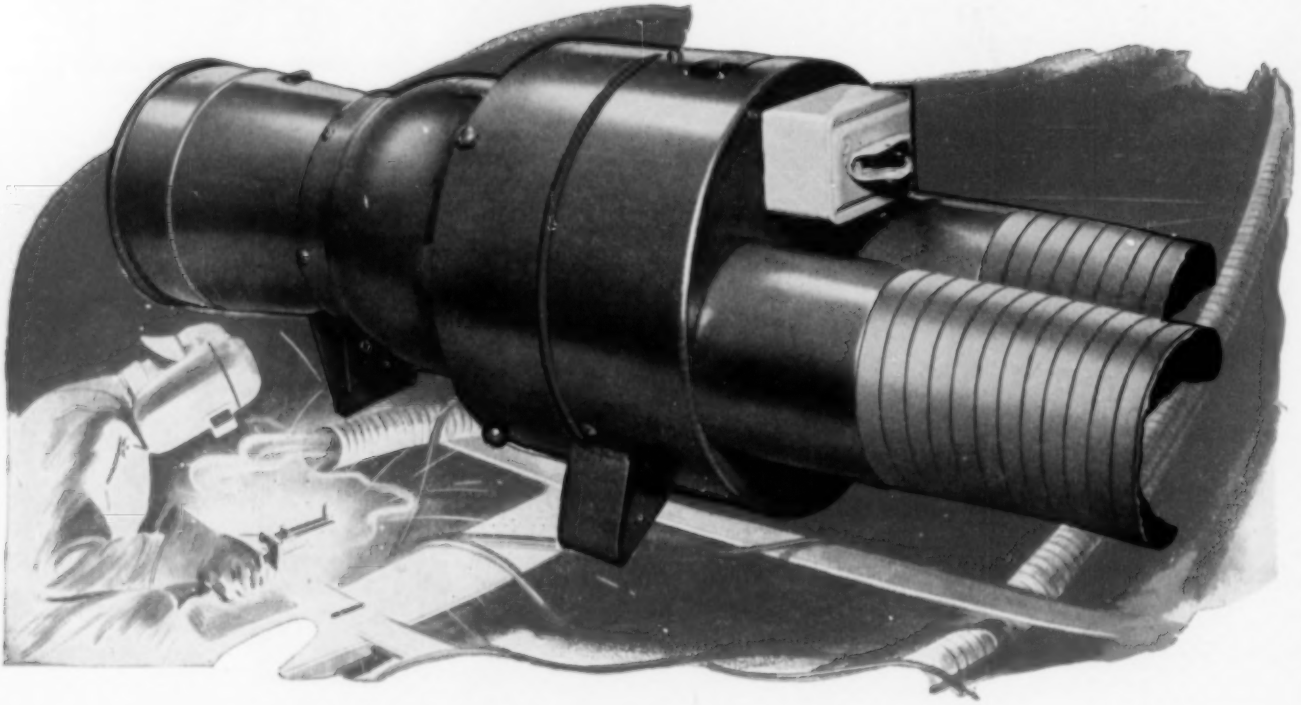
Action shot of pneumatic gun for elevating field crop into storage barn

VOLUME 55 · NUMBER 3

NEW YORK · LONDON

An Extra Lung for A Man

HAVING TROUBLE BREATHING



The amount of work a man can do goes *down* when foul air comes *in* or the heat goes *up*. Are you giving your workers the equipment that will keep them efficient even when working in hot or noxious fumes?

Many concerns regard Coppus Blowers as "production tools" as well as "safety equipment". They help men to do more work and better work.

You can find in the Coppus line the right blower or exhauster for each "bad spot"—or perhaps one type will handle a variety of jobs. In addition to man-cooling and removing fumes from confined places, Coppus Blowers are used for cooling and drying materials and equipment. They are portable . . . efficient . . . built to Coppus "Blue Ribbon" standards of construction and workmanship in order to withstand severe usage.

Check and mail the coupon for specific information. Coppus Engineering Corp., Worcester 2, Mass. Sales Offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in BEST'S SAFETY DIRECTORY, CHEMICAL ENGINEERING CATALOG, REFINERY CATALOG.

ANOTHER
COPPUS
"BLUE RIBBON" PRODUCT

COPPUS ENGINEERING CORP., 203 PARK AVENUE, WORCESTER 2, MASS.

Please send me information on the Blowers that clear the air for action.

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ in aeroplane fusilages, wings, etc.
- ☐ on coke ovens.
- ☐ on steam-heated rubber processes.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
- ☐ general man cooling.
- ☐ around cracking stills.
- ☐ exhausters, welding fumes
- ☐ stirring up stagnant air wherever men are working or material is drying.

NAME .....

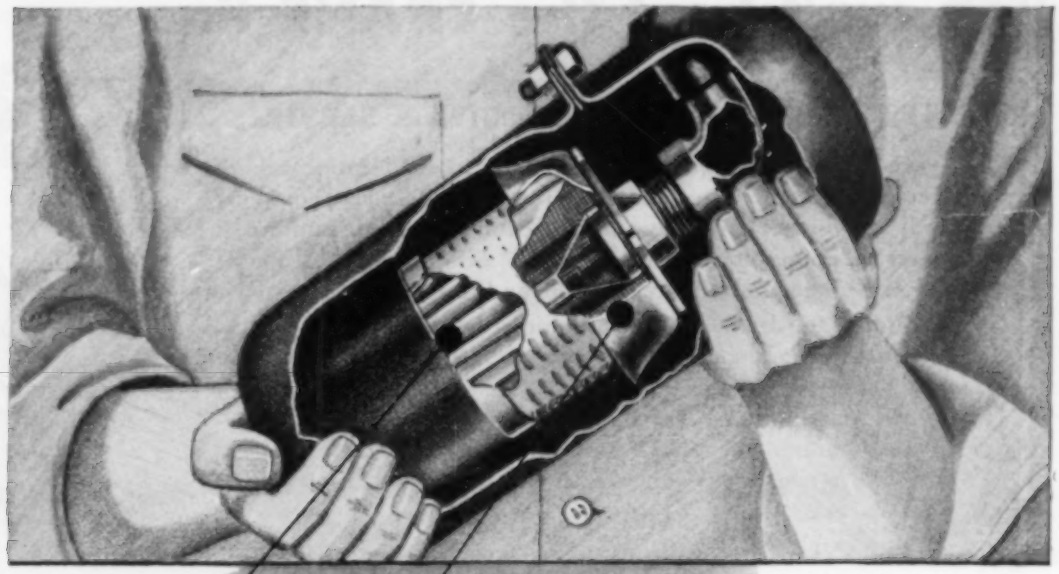
COMPANY .....

ADDRESS .....

CITY .....

(Write here any special ventilating problem you may have).

STAYNEW PIPE LINE FILTERS



ELIMINATE MOISTURE OIL DIRT PIPE SCALE from Compressed Air Lines

Tests prove that Staynew Filters often save their entire cost in just a few weeks. By preventing the passage of foreign matter, including moisture (water and oil), they prevent excess wear, costly freeze-ups, damage to materials and interference with processes.

EXCLUSIVE DOUBLE-ACTION PRINCIPLE PROVIDES:

MECHANICAL SEPARATION—Deflector Cup drives foreign matter to bottom of container where heavier particles are deposited.

FILTRATION—air or gas rises thru the original Radial Fin Insert which removes the lighter material.

DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

IMPORTANT APPLICATIONS: Protection of Air-operated Tools and Controls • Paint Spraying • Sand Blasting • Air Displacement or Agitation of Liquids

COMPLETE DETAILS ON REQUEST

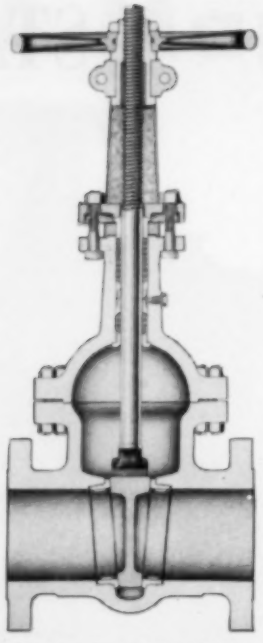
DOLLINGER CORPORATION

7 CENTRE PK., ROCHESTER 3, N. Y.

Representatives in Principal Cities

IN CANADA: McCarthy and Robinson, Toronto
Engineering Equipment Co., Montreal

For completeness of selection You can't beat the CRANE line



No. 33XR, 300-Pound Steel Gate for steam up to 850° F.; for water, oil, air or gas up to 500°F. Exelloy to Nickel Alloy seating. Sizes: 1½ to 24 in.

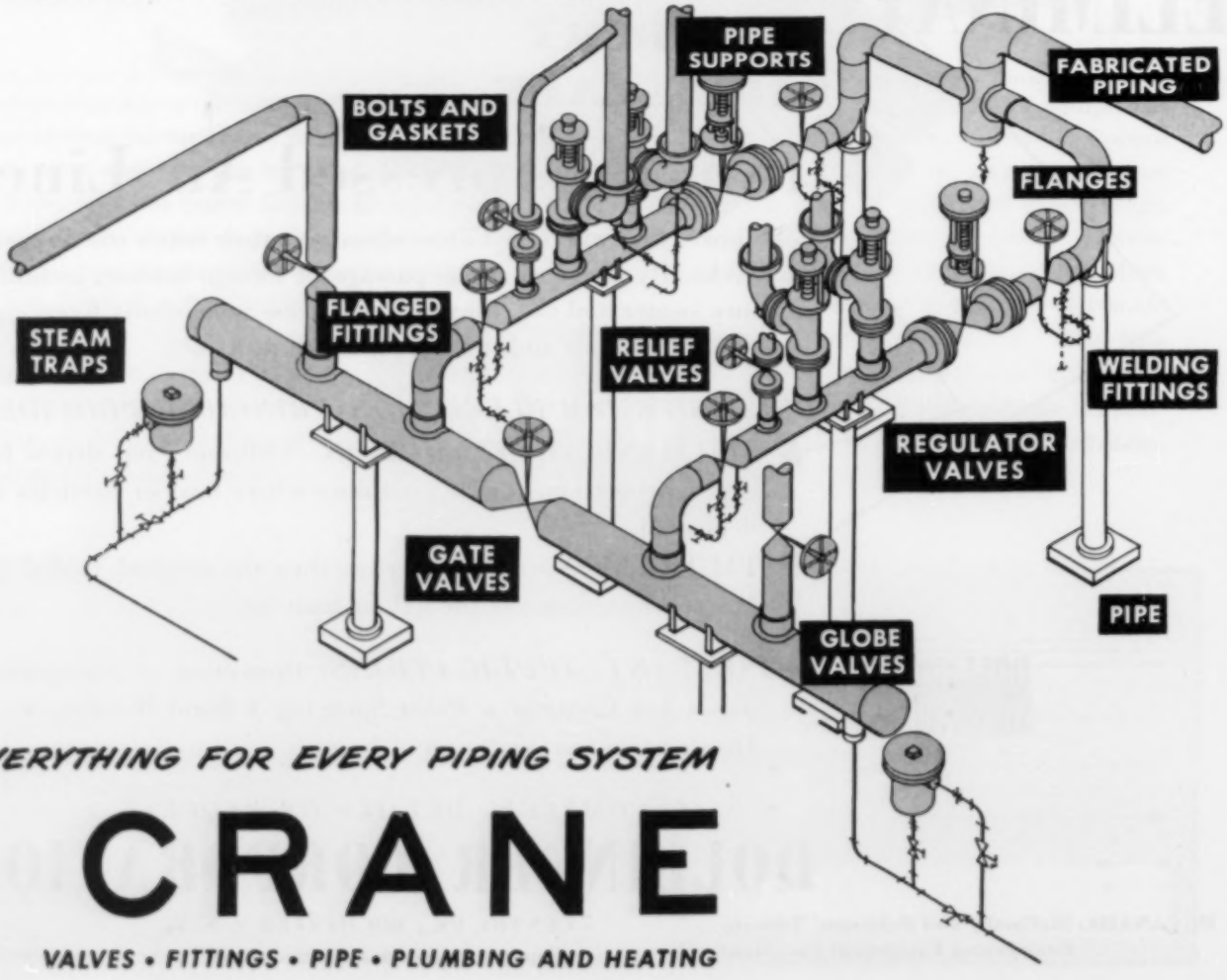
STEEL VALVES FOR SEVERE STEAM SERVICES

Crane Cast Steel Wedge Gate Valves find wide application wherever exceptionally rugged and durable steel valves are required. Body and bonnet have heavy metal sections and ample reinforcements at points under greatest stress. Straight-through ports assure minimum turbulence, erosion, and resistance to flow.

Solid wedge disc with close fitting disc guides maintains accurate seating on shoulder-type screwed-in body seat rings. "T-head" disc-stem connection prevents side strain on stem. Available in pressure classes from 150 to 1500 pounds with a variety of trim materials especially suited for recommended services. Screwed, flanged, or welding ends. See your new No. 49 Crane Catalog, p. 227.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving ALL Industrial Areas

ONE ORDER TO CRANE COVERS ALL PIPING EQUIPMENT FOR THIS PRESSURE REDUCER STATION, FOR EXAMPLE



EVERYTHING FOR EVERY PIPING SYSTEM

CRANE

VALVES • FITTINGS • PIPE • PLUMBING AND HEATING

For Longest air hose Service at Lowest on-the-job Cost

check the Goodyear line

GOODYEAR INDUSTRIAL RUBBER PRODUCTS

AIR-Specified TYPES OF AIR HOSE

EMERALD CORD—one-braid for small tools, two-braid for tough industrial jobs, three-braid for severest mine, quarry and construction use.

REDWING-H CORD—for rugged, direct-connection-to-compressor service.

WINGFOOT—for general industrial service, stationary compressor lines, light and medium pneumatic tool service.

STYLE MH AIR DRILL—mine, quarry and construction use needing large-size hose for direct-connection to compressors.

ORTAC—extremely lightweight, supple hose for air-cleaning and other general duty.

THERE'S a Goodyear air hose for every application from small hand tools to heavy-duty quarry, mine and construction operations. Each is designed by the G.T.M. — Goodyear Technical Man—to give you the longest service at the lowest possible cost in the long run. All are available through your nearest Goodyear Distributor, so see him today.

FOR HOSE, FLAT BELTS, V-BELTS, MOLDED GOODS, PACKING, TANK LINING built to the world's highest standard of quality, phone your nearest Goodyear Industrial Rubber Products Distributor.

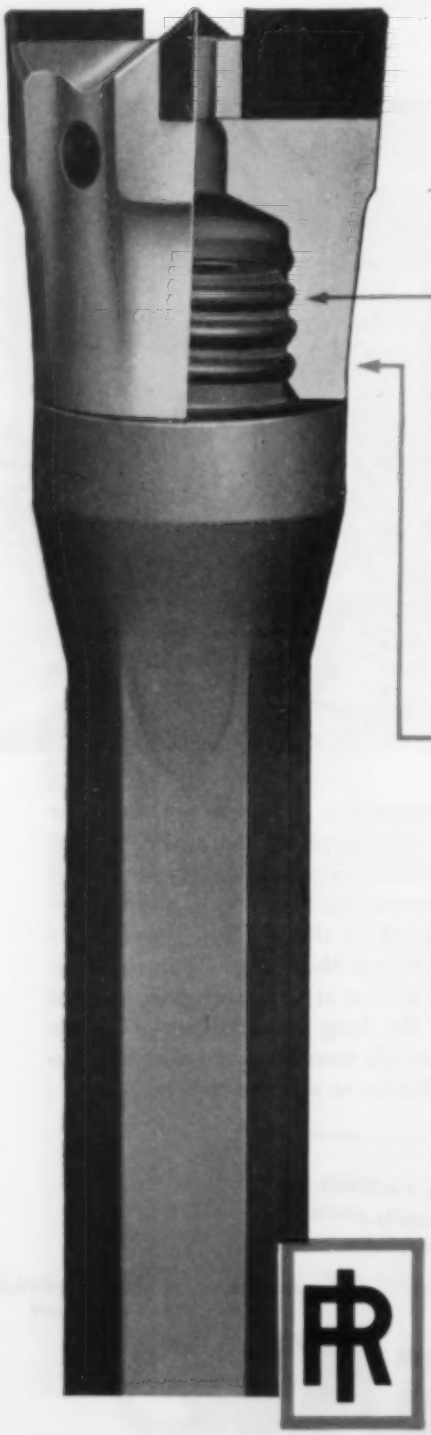
We think you'll like
"THE GREATEST STORY EVER TOLD"
Every Sunday — ABC Network

GOODYEAR

THE GREATEST NAME IN RUBBER

Emerald Cord, Redwing, Wingfoot, Ortac—
T.M.'s The Goodyear Tire & Rubber Company

Now CARSET JACKBITS give even better performance



. . . with this new attachment developed exclusively for use with tungsten carbide bits

(Series 100 Carset Jackbits)

The experience gained in the field with hundreds of thousands of Carset Jackbits, has enabled Ingersoll-Rand engineers to develop an attachment that matches the revolutionary performance and long life of Carset Jackbits. It is the only attachment now available designed primarily for use with tungsten carbide bits.

This new attachment incorporates a patented 38-degree reverse buttress thread. After exhaustive tests, it was selected as the best design to cushion and absorb the destructive reciprocating and rotational forces that tend to wear bit threads or break the threaded extensions on drill rods.

In addition, the attachment permits appreciably more metal in the skirt walls of Carset Jackbits which greatly increases their body strength. This added metal makes the strongest possible bits. This is particularly important in small bit sizes.

In short, even greater economies are now possible from Carset Jackbits. This new attachment is designed to give trouble-free service for the life of the bit.

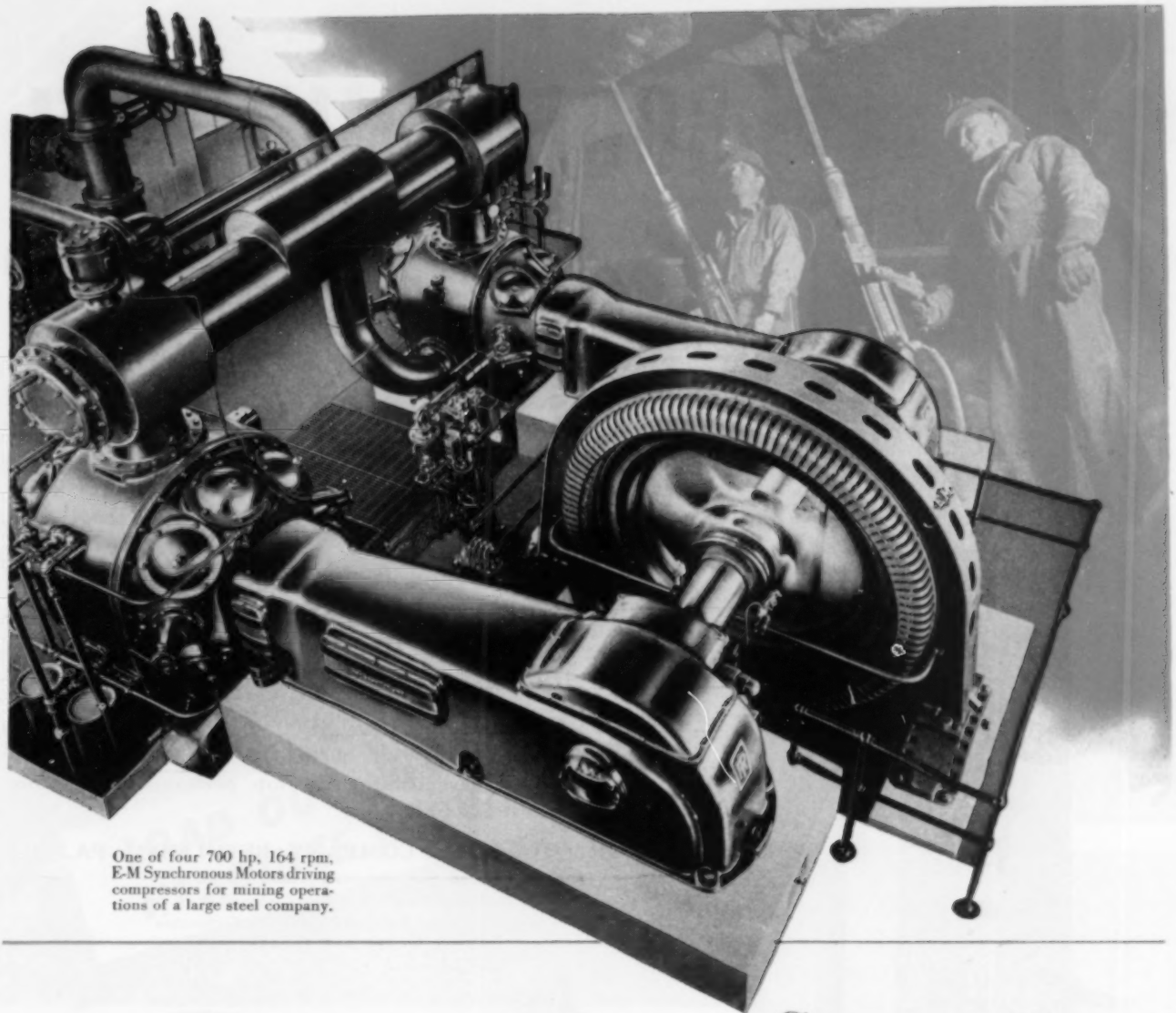
The Ingersoll-Rand Series 100 attachment is offered in four sizes and covers bit gauges from 1⅜ inches to 3 inches. It is easy to make this attachment... upset the drill rods on a sharpener and form the threads on an engine lathe or a Toledo threading machine. Write today for full information to Ingersoll-Rand Company, New York, or any of our 27 domestic branches.

CARSET JACKBIT
SET WITH CARBOLOY INSERTS

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 489-15

ROCK DRILLS · COMPRESSORS · AIR TOOLS · TURBO BLOWERS · CONDENSERS · CENTRIFUGAL PUMPS · OIL & GAS ENGINES



One of four 700 hp, 164 rpm, E-M Synchronous Motors driving compressors for mining operations of a large steel company.

How compressor manufacturers Save money

...for the user of Air Power

● Leading compressor manufacturers, experienced in furnishing millions of horsepower, recommend Synchronous Motors for most efficient large compressor operation. They have found that the qualities of a Synchronous Motor mean real savings to the user of air power. That's why motor and compressor are designed and built with matching characteristics . . . and why the Synchronous Motor is the standard drive for large compressors.

E-M pioneered the development of the Synchronous Motor, was one of the first to apply its use to compressors. Today, E-M motors are used on a big share of all compressor drives. Their selection for such important jobs as the one pictured here is based largely on high efficiency and resultant savings.

Installation after installation confirms E-M Synchronous Motors' recognized dependability, wins for them their reputation as "the most efficient drive in industry".

ELECTRIC MACHINERY MFG. COMPANY
MINNEAPOLIS 13, MINNESOTA

E-M

SYNCHRONOUS MOTORS
are the first choice for
COMPRESSOR DRIVES

●

LOWEST COST operation because of inherently efficient design.

DIRECT DRIVE for simplicity and minimum maintenance.

HIGH STABILITY to keep motors going despite voltage dips.

HIGH POWER FACTOR for preferential rates, improved voltage regulation.

LOWEST INSTALLATION COST for only two basic motor parts, stator and rotor.

MAGNETIC CONTROL with push button starting. "Conscious control", provided by Polarized Field Frequency Relay, cooperates with the motor for smooth starts.

E-M

A2049

GOOD DRILL STEEL

Keeps them drilling

When you order Bethlehem Hollow you know you're getting a tough, fatigue-resisting steel. It's top-quality drill steel that stays on the job, keeps costs at rock bottom. For example, on a recent construction job Bethlehem Hollow put down 224,000 ft of 1½-in. holes, helping to maintain a fast drilling schedule under tough rock conditions.

Next time you need drill steel, order Bethlehem Hollow. There's no better steel for hard-rock drilling. Prompt shipment of standard sizes and sections from our mill or your nearest supplier.

ALL THE FEATURES YOU NEED

Ideal for either forged or detachable bits. Smooth center hole minimizes fatigue failure. Wide quenching range for easy heat-treating. Controlled hardenability for top performance. Rigidly inspected for quality and uniformity.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM HOLLOW DRILL STEEL

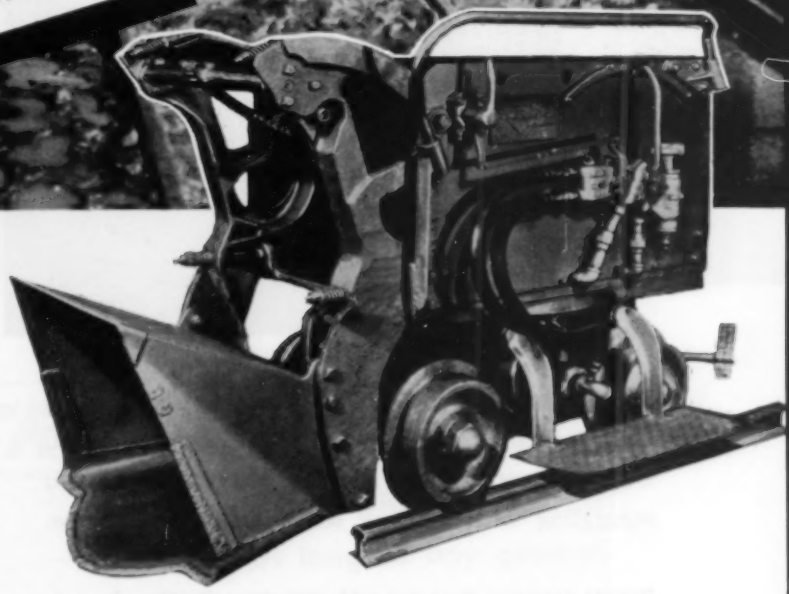
LOAD OUT WIDE HEADINGS ECONOMICALLY

For the job of mucking out big tunnels many contractors have found that it's frequently possible to make a better overall showing by using the highly efficient Eimco RockerShovel rather than large costly machines with high maintenance expense.

For every job, no matter what size rock you have, there is an efficient Eimco RockerShovel to do the loading.

Eimco's are preferred over all other types of loading equipment because they load faster, operate easier, and are much lower in maintenance costs.

Write for Bulletin L1018 on "Loading Out Wide Headings Economically."



Picture above shows contractor loading out 14' high x 25' wide heading using 2 Model 21 RockerShovels. The Model 21 (inset) is 33½" wide and 50" long (bucket up). It loads cars up to 66" above the rail, weighs 7400 lbs. and loads at the rate of 2 to 3 tons per minute.

EIMCO

A21

THE EIMCO CORPORATION

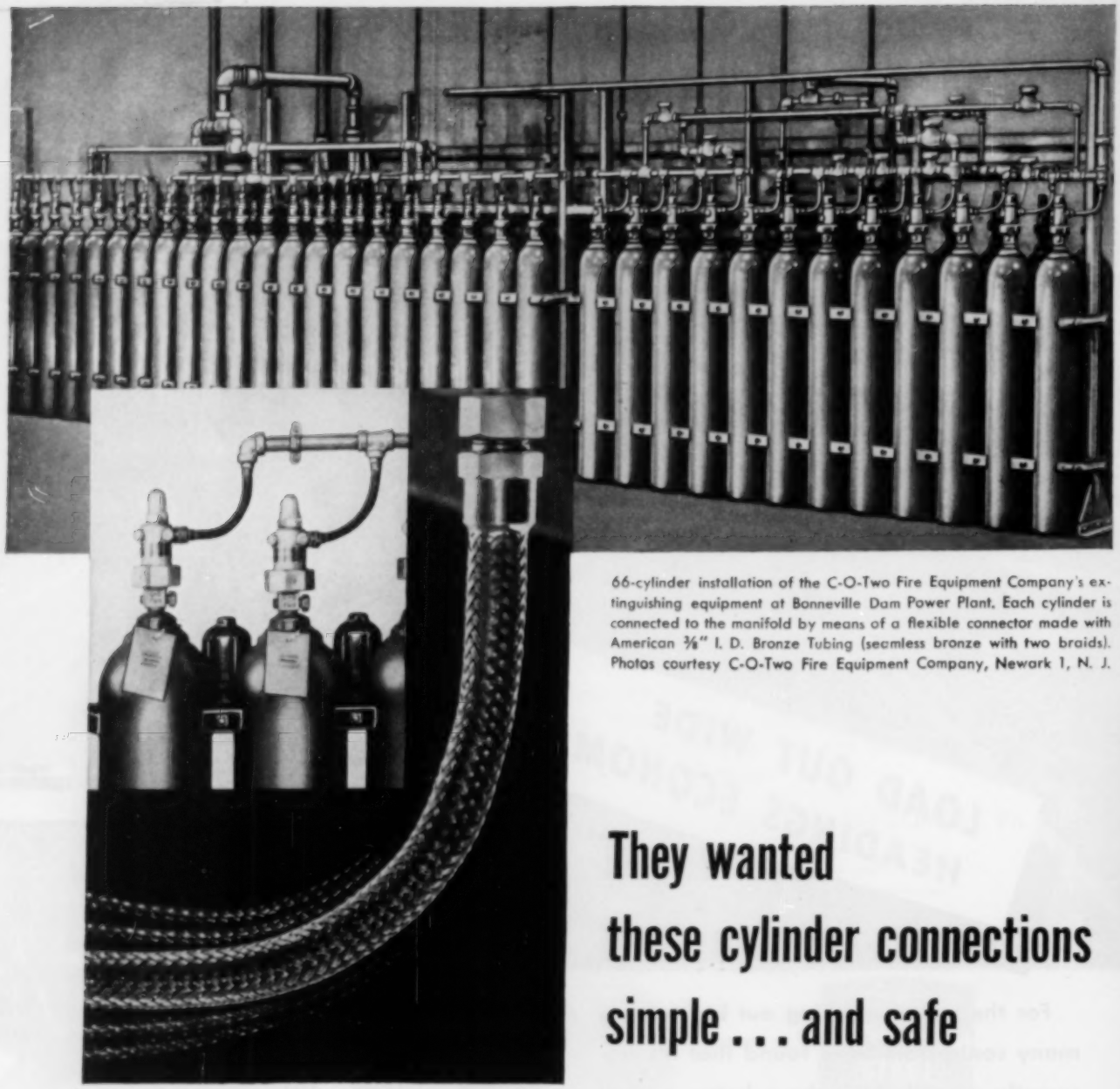
The World's Largest Manufacturers of Underground Rock Loading Machines

EXECUTIVE OFFICES AND FACTORIES — SALT LAKE CITY 8, UTAH, U. S. A.

BRANCHES NEW YORK, CHICAGO, BIRMINGHAM, EL PASO, BERKELEY, DULUTH

AFFILIATED COMPANIES SOCIETE EIMCO, PARIS, FRANCE
EIMCO (GREAT BRITAIN) LTD., LEEDS 12, ENGLAND

AGENTS IN ALL PRINCIPAL CITIES THROUGHOUT THE WORLD



66-cylinder installation of the C-O-Two Fire Equipment Company's extinguishing equipment at Bonneville Dam Power Plant. Each cylinder is connected to the manifold by means of a flexible connector made with American ⅜" I. D. Bronze Tubing (seamless bronze with two braids). Photos courtesy C-O-Two Fire Equipment Company, Newark 1, N. J.

They wanted these cylinder connections simple . . . and safe

So they used American Seamless Flexible Metal Tubing for the 66 manifold connectors in this installation. Couplings swing freely and accurately into line. No struggling with rigid or semi-rigid pipe or tube.

Resists corrosion, heat and cold; minimizes vibration. American Seamless Flexible Metal Tubing can be flexed thousands of times with no danger of failure—carries thousands of pounds pressure safely. For flexible metal hose or tubing designed for use with almost any gas, vapor, liquid, or even semi-solid, consult The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada: The Canadian Fairbanks-Morse Company, Ltd.

49259G

ANACONDA
from mine to consumer

wherever connectors must move . . . ***American***

FLEXIBLE METAL HOSE AND TUBING

TRI CLAD MOTORS
REG. U.S. PAT. OFF.
will run safely without relubrication for as long as any general-purpose motor you can buy—
and if the application makes relubrication a *must*, you can grease a TRI CLAD *without* halting production
GENERAL ELECTRIC
HERE'S WHY

TRI CLAD MOTORS will run safely without relubrication for as long as any general-purpose motor you can buy—

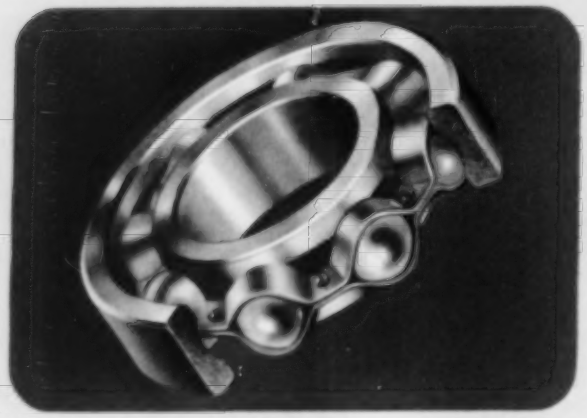
Tri-Clad extra lubrication "protection" can save you money because:

1. Tri-Clad's oversize grease reservoir and the heaviest standard-service bearings mean you do not have to bother with greasing between motor check-ups.

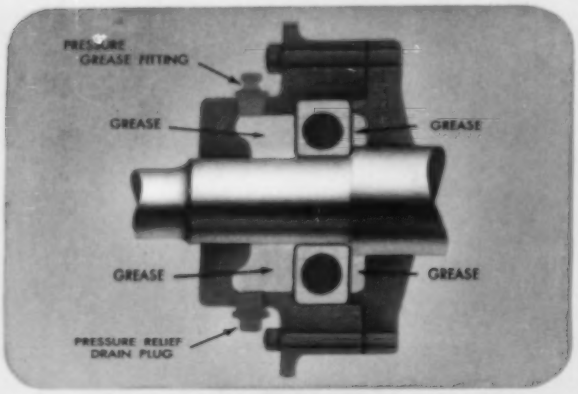
2. When relubrication is needed on those tough applications, you can grease a Tri-Clad without interrupting production-line operations.

Tri-Clads are grease-gun easy to lubricate *on the job*. Moreover, a Tri-Clad motor will run safely where an ordinary motor would fail. Chances are you'll be spared the cost of a "special" motor.

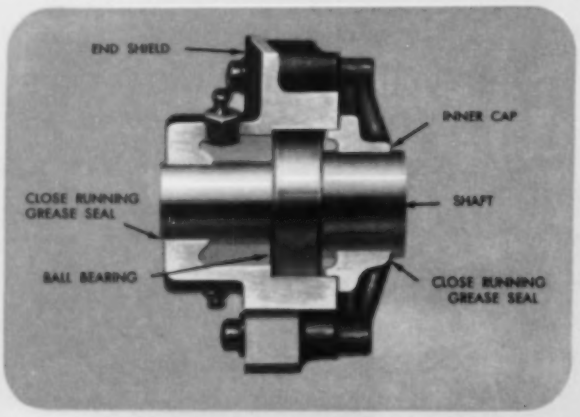
YOU BE THE JUDGE! The best way to prove to yourself that Tri-Clad gives you the most for your motor dollar is to contact your local G-E office. Tri-Clad stocks are complete. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*



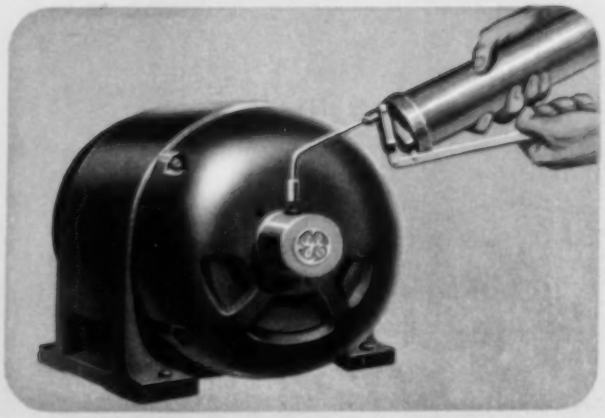
1 **EXTRA BEARING PROTECTION** — Tri-Clad gives you extra bearing protection because heaviest standard-service bearings are carefully selected to withstand severe loads for long periods.



2 **EXTRA GREASE** — Four times the ordinary amount of grease is packed into the large Tri-Clad grease reservoir. Since bearing life depends on grease, this means that Tri-Clad motors will run safely for years — for as long as any general-purpose motor you can buy.



3 **SEALED-IN BEARINGS** — Bearings and grease are completely sealed in a cast housing with *long* running seals for *extra* protection from dirt, dust, and lubricant leakage.



4 **PRESSURE-RELIEF GREASING** — An efficient system of pressure-relief lubrication (with standard fittings) enables a Tri-Clad motor to be quickly and easily greased on the job when and if it's needed.

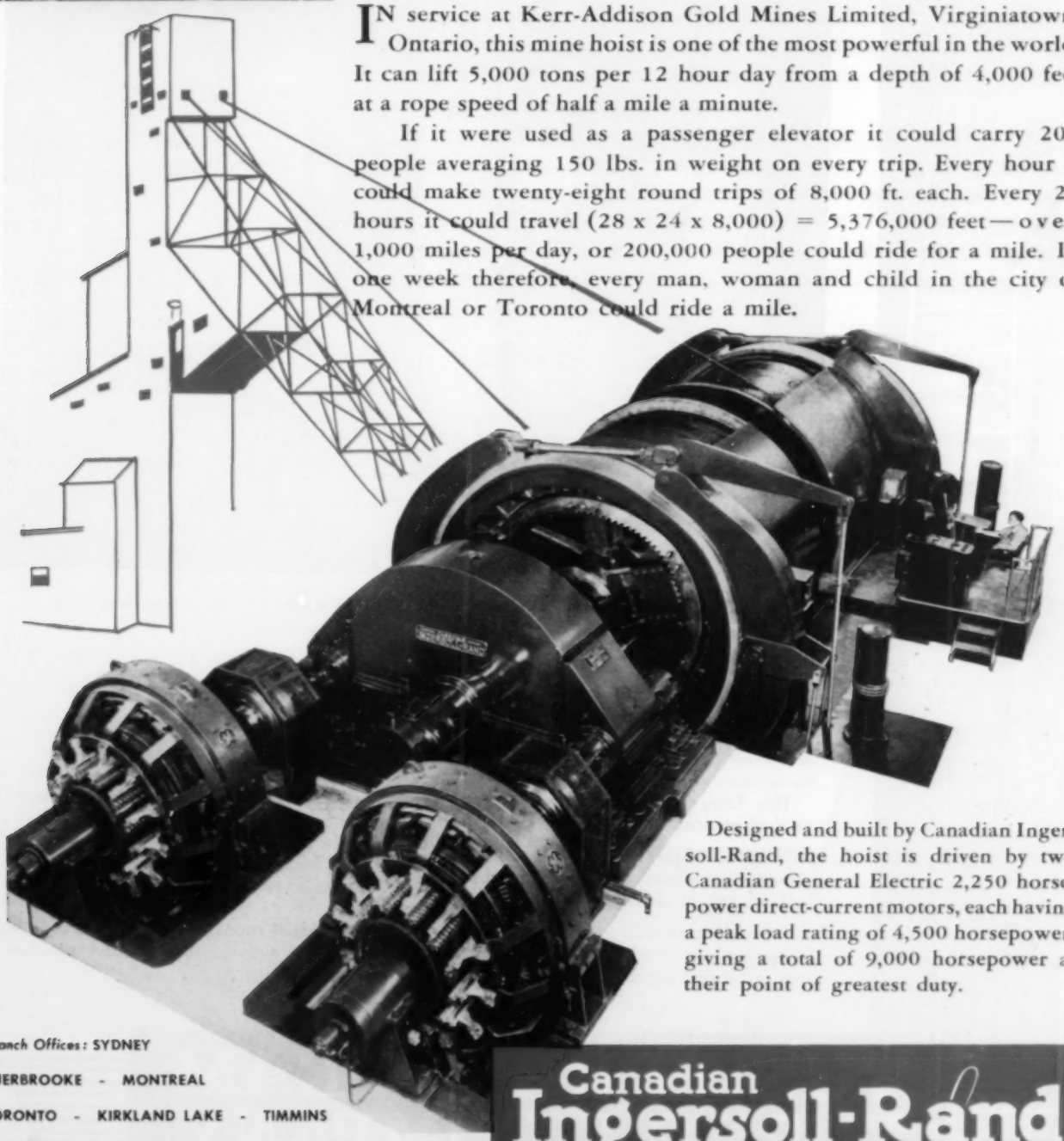
GENERAL ELECTRIC

752-3

EVERY WEEK EVERYONE in Montreal or Toronto COULD RIDE A MILE!

IN service at Kerr-Addison Gold Mines Limited, Virginiatown, Ontario, this mine hoist is one of the most powerful in the world. It can lift 5,000 tons per 12 hour day from a depth of 4,000 feet at a rope speed of half a mile a minute.

If it were used as a passenger elevator it could carry 200 people averaging 150 lbs. in weight on every trip. Every hour it could make twenty-eight round trips of 8,000 ft. each. Every 24 hours it could travel (28 x 24 x 8,000) = 5,376,000 feet—over 1,000 miles per day, or 200,000 people could ride for a mile. In one week therefore, every man, woman and child in the city of Montreal or Toronto could ride a mile.



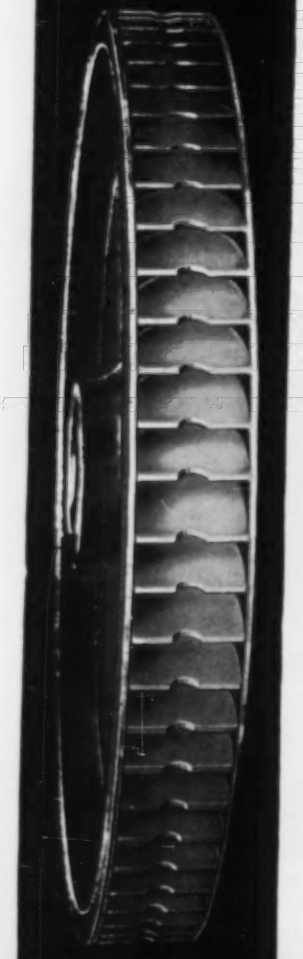
Designed and built by Canadian Ingersoll-Rand, the hoist is driven by two Canadian General Electric 2,250 horsepower direct-current motors, each having a peak load rating of 4,500 horsepower, giving a total of 9,000 horsepower at their point of greatest duty.

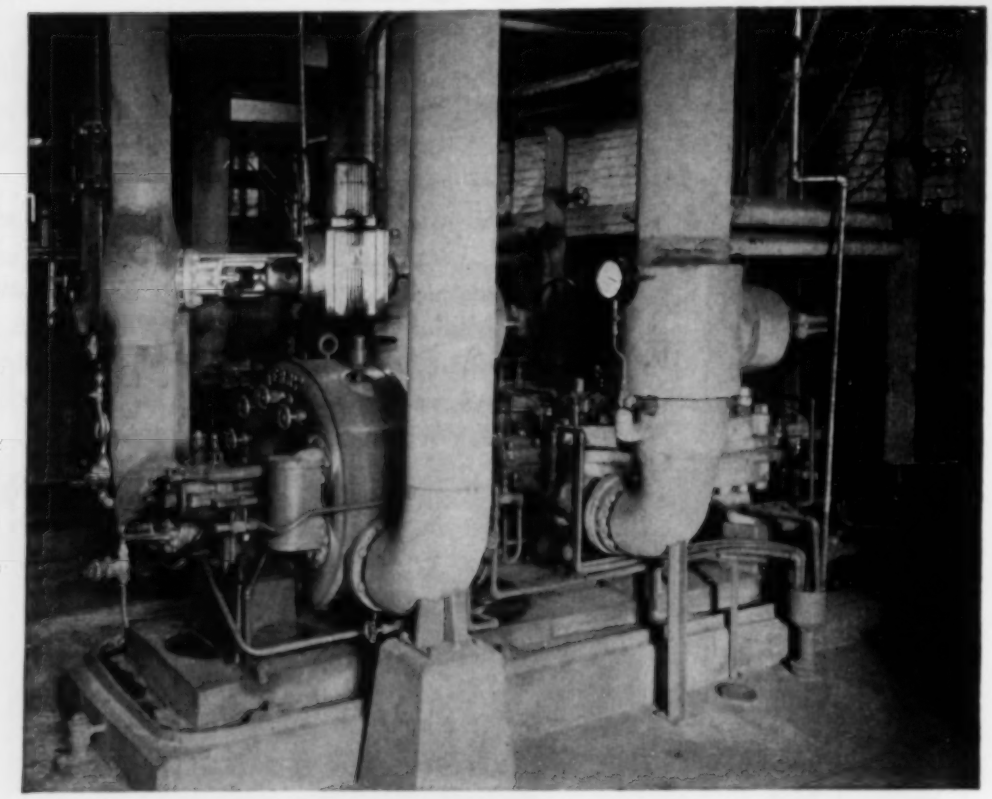
Branch Offices: SYDNEY
SHERBROOKE - MONTREAL
TORONTO - KIRKLAND LAKE - TIMMINS
WINNIPEG - CALGARY - NELSON - VANCOUVER

K-18

Canadian Ingersoll-Rand Company Limited
HEAD OFFICE MONTREAL QUE WORKS SHERBROOKE QUE

TERRY





This 600 hp high pressure, high temperature Terry Turbine is used to drive a boiler feed pump.

WHY
AMPLE BLADE CLEARANCES ARE SO IMPORTANT

This Terry Turbine has large radial and axial clearances.

If radial clearance should become reduced, the blades are protected by projecting rims at sides.

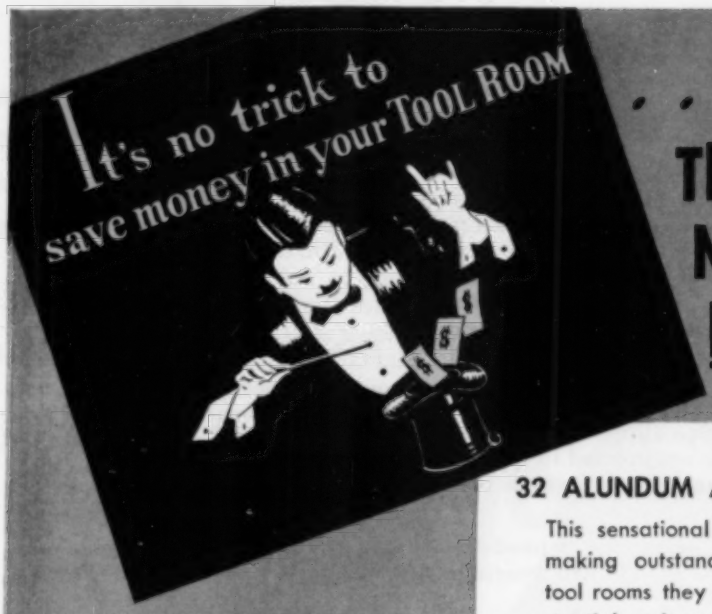
The side clearance — one inch — is so large that possible end p'ay from excessive external thrust can cause no damage to the wheel. And frequent inspection of thrust bearings is unnecessary.

Write us on your business letterhead for a copy of Terry Bulletin S-116 describing these construction features and other Terry advantages.

Our district representative will be glad to discuss your specific turbine drive problem with you.

T-1173

THE TERRY STEAM TURBINE COMPANY
TERRY SQUARE, HARTFORD, CONN.



. . . Because-

There's a Cost-Cutting Norton Wheel for Every Tool Room Job

32 ALUNDUM Abrasive—

This sensational abrasive—new and exclusively Norton—is making outstanding records everywhere. In thousands of tool rooms they are finding that "32" wheels can make substantial savings on all types of sharpening operations on high speed steels. Its unique crystal structure gives grains that are *sharper*—they penetrate sensitive high speed steels more easily, cutting faster and cooler.

38 ALUNDUM Abrasive—

The original white abrasive, "38" has been a tool room favorite for forty years and is still popular with many tool grinders. It is the recommended abrasive for sharpening jobs where feeds are very light.

57 ALUNDUM Abrasive—

One of the newer Norton abrasives, "57" combines a fast cutting action with great toughness. Thus it is widely used for offhand tool grinding operations. Its slightly lower price also makes it popular for precision sharpening jobs in shops where the first cost of the wheel is given major consideration.

NORTON
ABRASIVES

Making better products to make other products better

It's really no trick to save money in your tool room if you have the right Norton wheels – wheels carefully selected to meet the exact requirements of each of your tool grinding jobs. Your Norton abrasive engineer or your Norton distributor will be glad to help in that selection job. You'll find a lot of helpful information in the Norton handbook on tool room grinding. Send for a copy – just ask for Form 835-F-2

NORTON COMPANY, WORCESTER 6, MASS. · Warehouses in Five Cities · Distributors in All Principal Cities

How TIMKEN® bearings help a compressor hold up under pressure

TO insure smooth, trouble-free performance under the tough conditions of rush construction jobs, Ingersoll Rand mounts their compressor crankshafts on Timken® tapered roller bearings.

Timken bearings carry both radial and thrust loads, thanks to their tapered design. As a result, shafts and adjacent parts are held in proper alignment, with less wear and less chance of breakdown on the job.

Maintenance and lubrication time are kept to a minimum because Timken bearings permit closures that keep lubricant in—dirt and dust out. Due to line contact between rolls and races, Timken bearings have extra load carrying capacity. True rolling motion and incredibly smooth surface finish practically eliminate friction. Made of Timken fine alloy steel, Timken bearings are engineered to last the life of the machine in which they are used.

Over the years, the dependable performance of Timken bearings have made Timken bearing equipped products first choice throughout industry. Timken bearings in *your* product add a valuable sales feature. When you specify tapered roller bearings for the equipment you make—or the equipment you buy, specify "Timken". Look for the trade-mark "TIMKEN" on the bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

INGERSOLL RAND COMPRESSORS—*shown here on Pennsylvania Turnpike job near Harrisburg, Pa.—are Timken-equipped for long life, trouble-free operation.*

DESIGN LEADERSHIP

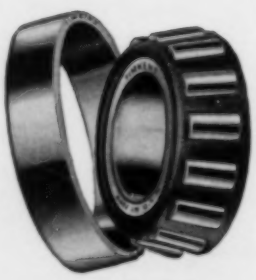
The first Timken tapered roller bearing was produced in 1898. Since then the one-piece multiple perforated cage, wide area contact between roll ends and ribs, and every other important tapered roller bearing improvement have been introduced by The Timken Roller Bearing Company.

The Timken Company leads in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

NEW
CONTROLLED-POWER CHIPPING HAMMER

selected to fit operator's preference enabled him

to produce

184% additional work...

...when tested

against hammer picked at random from production floor

These new hammers enable the operators to produce more with less effort.

Controlled-Power Chipping Hammers provide added power under "stalled-cut" conditions... they eliminate valve choking and short-stroking of pistons... they provide smooth power, automatically responding to the demand for more air ... they give immediate starting with full power ...they permit smooth, graduated cutting... *they give you a selection of 15 power sizes where formerly you had only 5.*

Let us arrange a similar test in your shop, under your conditions and with the metals you are chipping. The results will enable you to determine what hammer replacements will be profitable.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 482-B

TEST DATA*

The new size E2A Controlled-Power Hammer was tested against three comparable 2" Stroke Hammers currently in use in customers plants. All tests were made with 85 lbs. air pressure at the tools and for a duration of 30 seconds.

Test No. 1
E2A Controlled Power Hammer Serial 907 2.45 oz.
2" Stroke Hammer (Brand New) Serial 109,534 ..... 1.84 oz.
Gain .61 oz. or 33%

Test No. 2
E2A Controlled Power Hammer Serial 907 2.45 oz.
2" Stroke Hammer Serial 54272 (Selected as above average)..... 1.24 oz.
Gain 1.21 oz. or 97%

Test No. 3
E2A Controlled Power Hammer Serial 907 2.45 oz.
2" Stroke Hammer Serial 64099 (Picked at random by customer)..... .86 oz.
Gain 1.59 oz. or 184%

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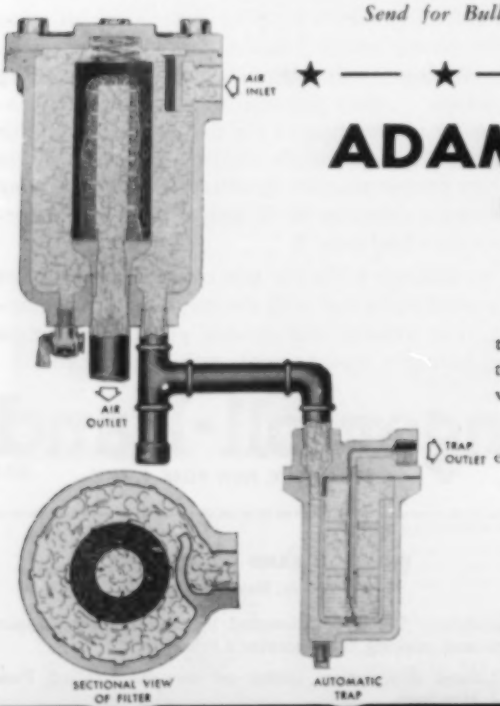

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ON THE COVER

IN AN effort to ease the arduous work of unloading baled hay into a storage barn, F. W. Moffett, Jr., developed an air-powered gun and used it in 1948 to elevate some 15,000 bales at his Idyllbrook Farms near Rochester, N. Y. During the 1949 season it was tested at Iowa State College, Ames, Iowa, by Prof J. B. Liljedahl and E. L. Barger of the Department of Agricultural Engineering. Results were reported to the American Society of Agricultural Engineers at Chicago, Ill., last December. Our cover picture and the one in this column were taken in Ames.

The gun consists essentially of a cylinder and piston surrounded by storage space for the compressed air that operates it. Air displaced by the piston's upward stroke is compressed at the top of the cylinder and in an auxiliary storage tank with which the former is connected. This trapped air, plus a small amount transferred from below the piston, returns the latter to its original position after each stroke. Air is supplied at around 200 psi. pressure and can be reduced by a regulating valve to meet conditions imposed by the varying heights and distances bales must be shot.

The gun is normally stationed on the ground alongside the truck carrying the hay from the field and from 10 to 15 feet away from the barn. It is trained, as required, to land the bales in the barn opening. Tests revealed that at a 60° angle of elevation and with 200 psi. pressure a 58-pound bale traveled 48 feet horizontally and reached a height of 21 feet. At a 45° angle the bale went 58 feet horizontally and rose 14 feet.

A man on the truck operates the gun by means of a rope that passes over a pulley on a vertical pole and then to an air-control valve. One man can charge the gun, but to lighten the physical effort involved a crew of two is desirable.

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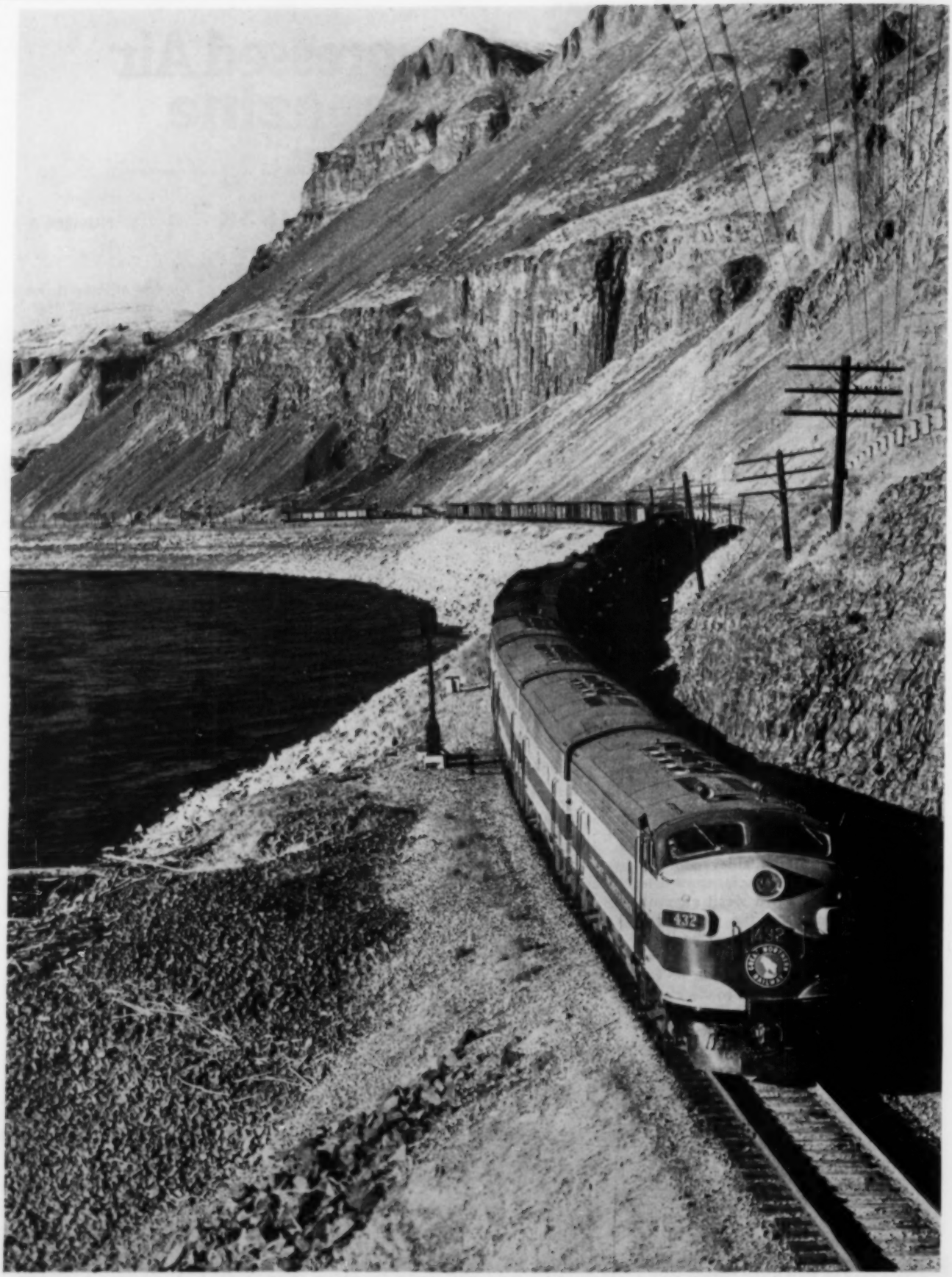


CRUISING DOWN THE RIVER

A Great Northern Railway freight train, drawn by a 4-unit, 6000-hp. diesel-electric locomotive, snakes its way through the canyon of the Columbia River near Rock Island, Wash. Modern railroads have the power to move almost any load but have to refuse some shipments because they are too high or too wide to clear structures along the line.

Getting the Big Load Through

Railroad Men Who Route Bulging Flatcars Know What a Close Shave Is

Roy E. McFee

A CIVIL engineer in the offices of the Cherry Valley Railroad reads a rush message from the transportation department and, after careful study and checking, replies as follows: "Our lines can safely handle the load offered by the Harrison Lumber Company for movement from Delaware Center to Huron City under the following restrictions:

"This load must not be handled over the freight cutoff, but shall be routed over the main line.

"The load must be moved in local freight and during daylight hours only. The speed shall not exceed 30 miles an hour, and shall be reduced to 10 miles an hour around curves and when passing standing cars on an adjacent track.

"This load must not pass other wide loads or any moving trains or cars on adjacent tracks.

"At the curve west of Orpington the adjacent track shall first be cleared.

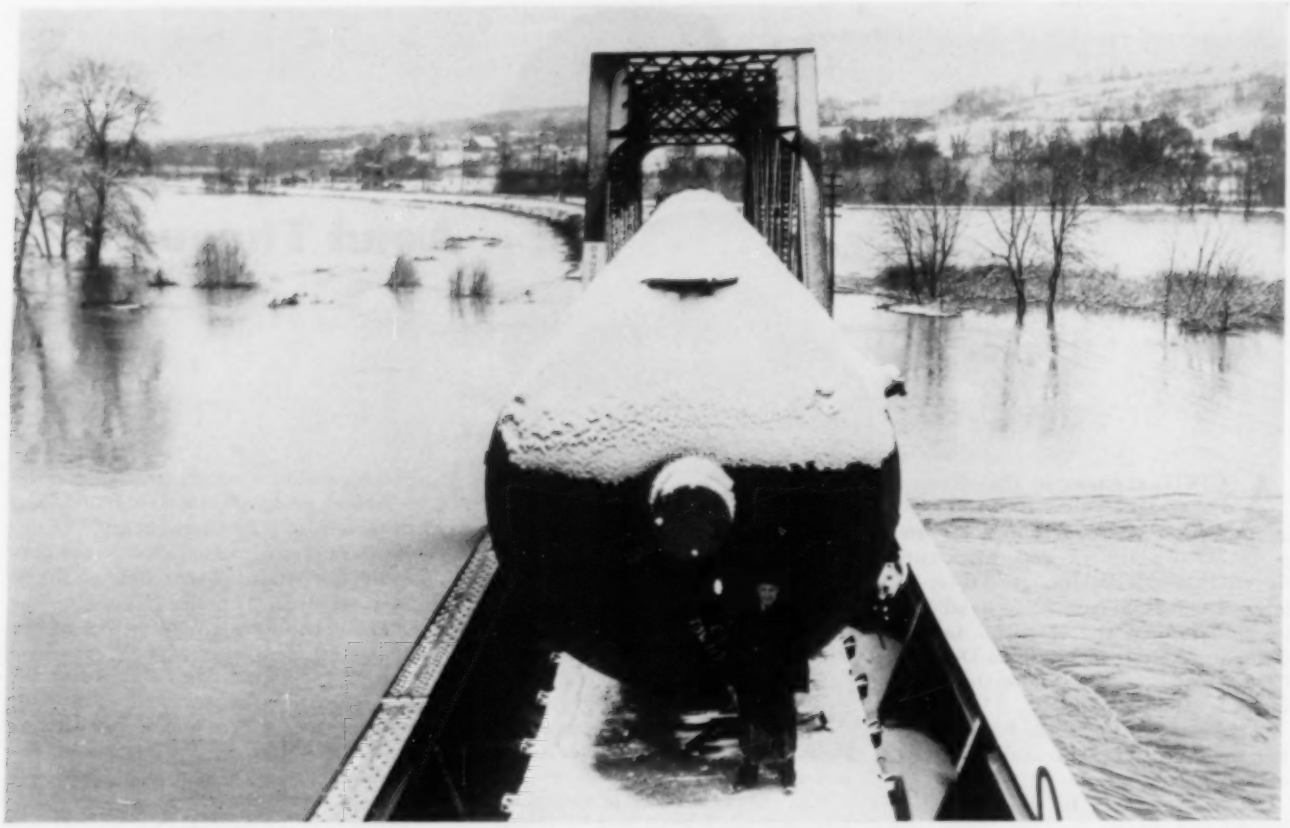
"At Delhi Junction a detour shall be made past the coal dock by using a yard track.

"This load is to be handled with extreme caution throughout. Under the overhead bridges between Ludlow and the lakefront the movement must be under the personal supervision of the conductor or trainmaster, who shall be ready to order an immediate halt if he has any doubt as to the safety of the move."

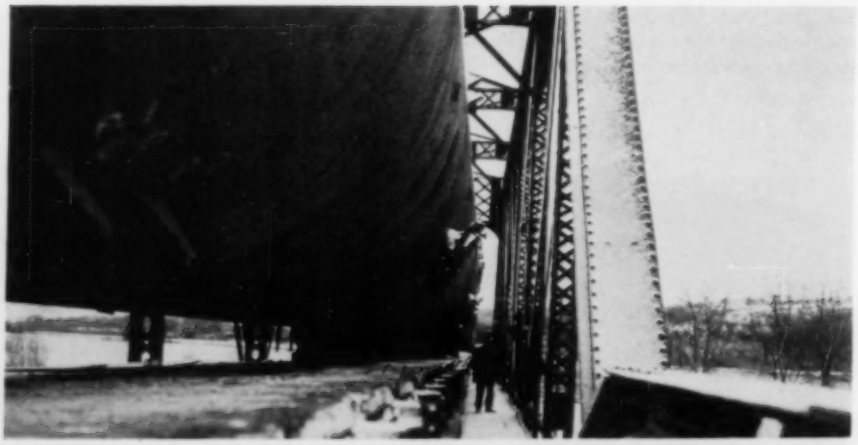
Such is the message that goes to the transportation department over the signature of the chief engineer and shows just what railways have to contend with in handling oversize freight loads on flatcars. A railroad, with all its vast resources and its right of way representing an investment of millions of dollars, is still hampered by limitations that affect flatcar shipments. To begin with, mainline tracks are, as a rule, only 13 feet

ONE OF THE BIGGEST LOADS

This steel fractionating column, or bubble tower, for a petroleum refinery was just the right size to fit on two flatcars Weighing 488,200 pounds, it constituted one of the heaviest freight shipments ever to pass over American railroads. It was photographed while on the St. Louis-San Francisco (Frisco) line en route to its destination in Texas.



WILL IT SQUEEZE THROUGH? . . .



ERIE RAILROAD PHOTOS

YEP — WITH ROOM TO SPARE

Here an oil-field vessel 123 feet long is shown moving over a bridge across French Creek near Meadville, Pa. Underneath, the stream is at flood stage.

apart, center to center, and yard tracks often are spaced even closer. Then, somewhere along the line there are certain to be overhead highway bridges that were built lower than the standard 22 feet above rail top. Elsewhere, a truss or a gusset plate on a through-girder bridge gives too little side clearance. With all these tight places, railroad civil engineers must use ingenuity in moving the larger flatcar loads. And some—though very few—they are compelled to reject, but only after their best minds have been in consultation several times to consider the matter from every angle.

Once in a while a shipment causes concern because of its excessive weight. That does not happen often, because nothing short of an unusual load can be as severe on the tracks or on a bridge as is an ordinary locomotive. Sometimes, however, the engineering department requires transfer of freight from the standard 6-axle flatcar to an ultramodern one with eight axles. That, of course, reduces the concentrated wheel load on the rails. Or the engineer's communication may contain these provisions: "An idler must be provided between this load and the locomotive. In switching the car, it must not under any circumstances be moved across the yard scales or on the Salem River drawbridge."

But most of the problems involve clearances. Suppose we first consider vertical or overhead clearance. Nearly every railroad is troubled with low bridges under which its trains must pass. Some of these are highway spans constructed by states or cities without allowing for railroad needs. Occasionally, another railroad crosses overhead and has kept its bridge as low as possible in order to have easier approach grades on its own line. Sometimes these clearances are as low as 16 feet, or 6 feet less than standard.

Recently, a string of six loaded flatcars was being moved from the Pacific to the Atlantic Coast. When the route was planned, a railroad in the Middle West was offered the business of hauling the train the length of its lines. But its engineers discovered at once that the underclearance of one of the bridges was 3 inches less than the maximum height of the loads. At that point the chief engineer, being an extremely practical man, solved the problem. He reflected: "That bridge has always been the bottleneck on our line, and here's our chance to get rid of it. We'll lower the tracks under the span and far enough back to make reasonable approach grades. It will cost

us a lot of money, but we'll collect enough revenue on the six cars to pay for it. And then we won't have any more trouble."

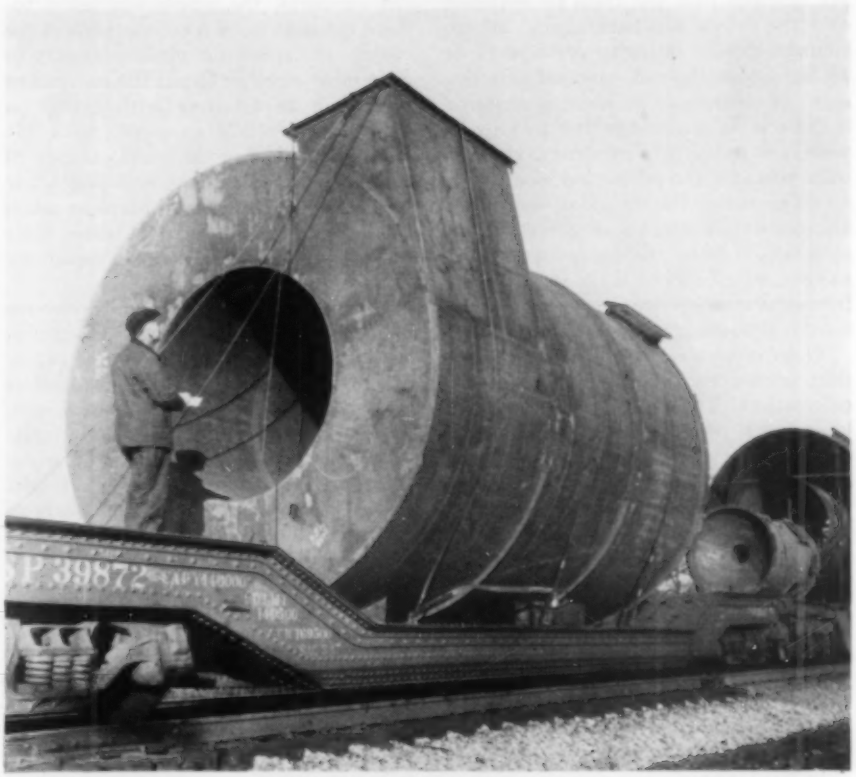
A different but rather radical method was used by a freight-train crew when suddenly confronted with a similar situation at a bridge. The height of the particular flatcar, laden, had apparently not been reported to the engineering department. The load looked suspiciously high to the experienced crew, so the man at the throttle approached the overhead structure with caution and stopped just in time. The freight was the slightest bit too high. If it were one inch lower it could slip under. So the resourceful crew derailed the car and dragged it clear of the bridge, with the wheels bumping over the ties. On the other side, it was put back on the track and taken on its way. Incidentally, the damage to the ties was considerable.

One way to cut down the height of a load is to use a depressed flatcar. Whereas the floor of the usual flat is somewhere from 3 feet 6 inches to 4 feet 3 inches above rail top, that of the depressed car may be only 2 feet 4 inches above that level. This difference may mean much in clearing bridges. But if the latter are of through-girder construction, care must be taken that the shipment does not strike low gusset plates.

Customers usually coöperate with railroads when the situation is explained to them. A man on a branch line had ordered a power shovel and was in a hurry for it. Fifty miles down the track was a bridge with insufficient clearance. A different scheme of loading was then suggested by the shipper, but the change would have meant a week's delay in delivery. So the purchaser stepped in with a solution of his own. He agreed to accept the shovel at the first station on the other side of the bridge and arrange to have it transported the remainder of the distance in some other way.

Side clearances generally are not such clear-cut cases and, in a sense, are even more troublesome. It is a fortunate railroad that does not have some narrow through-girder bridges that present problems now and then. Girders may rise several feet higher than the track on both sides of a train, while gusset plates bracing the top flanges are apt to encroach upon the standard clearance line. A load that is wide at the bottom may cause difficulties, and if it happens to be on a depressed flat the situation can be critical.

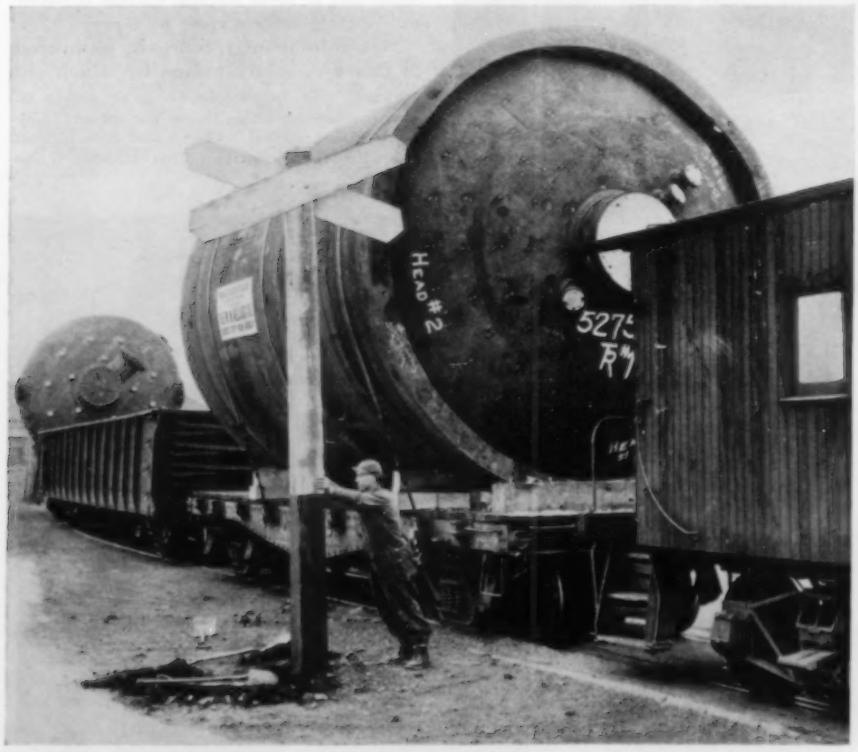
Often, too, a coal dock or a depot platform built on car-floor level near the track for a special reason might prevent the passage of a wide load. Under such circumstances there is generally a detour track around the place of close clearance. The engineering department sim-



ERIE RAILROAD PHOTO

SPECIAL EQUIPMENT

One way to reduce the height of a load is to put it on a depressed flatcar. The floor of the latter is from 14 to 23 inches lower than that of the usual flat. The one pictured has a capacity of 440,000 pounds.



A HELPING HAND

A little pick-and-shovel work and a lusty shove canted this signpost on the Lehigh Valley Railroad sufficiently to allow an oversize tank to skim by its overhead arms.

ply specifies that the train be switched over the detour and back again. Where the obstruction is high—perhaps 17 or 18 feet above the rail—and on only one side, an emergency measure is required if there is no alternative but to move a wide load past it. The flatcar is stopped upon reaching the projection, and lifting jacks are set on the frames of the trucks alongside the springs and facing the obstruction. After the jacks have lifted the car sufficiently to make it lean away from the interference, it is pushed past slowly. Removing the jacks rights the flat.

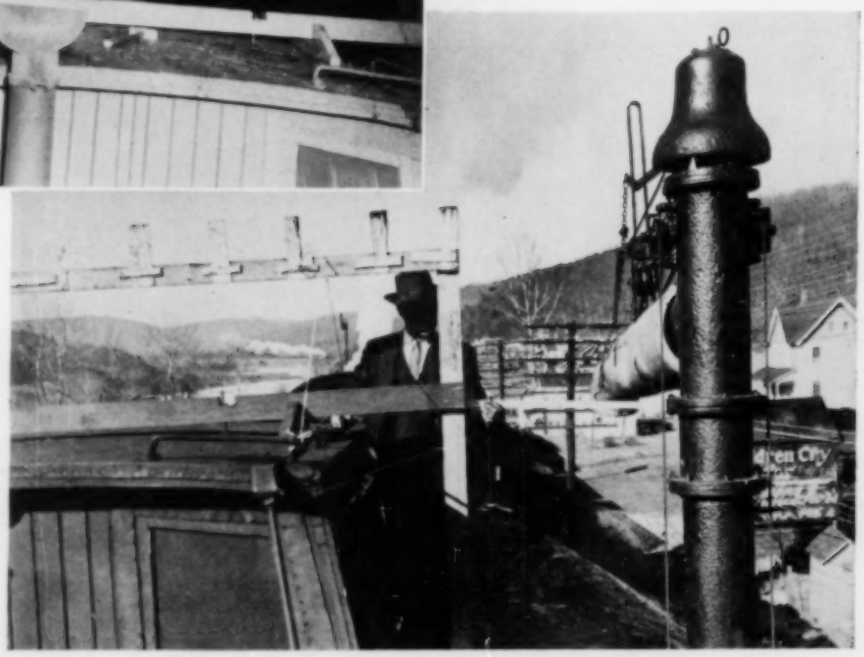
There is one situation in side clearance that necessitates a lot of mathematical calculation. That is when the load is so long that it rests on two flatcars, either end to end or with an idler between them. Such a shipment often consists of a boom, tank, or boiler, and may reach a length of 120 feet. Because the boom, let us say, rests on two temporary bolsters somewhere near its ends, passing a curve makes the middle of the load move toward the next track on the inside of the curve. And if the ends project beyond the supports, the overhangs move toward the next track on the outside of the curve. It takes some plane geometry to determine whether or not the movement is enough to interfere with traffic on those tracks. For example, on a 17° curve, if the end of the boom extends 20 feet beyond the support and over a car truck, the overhang may move as much as 21 inches toward the next track. That can easily be a serious matter, especially if the load is wide.

On a long railroad the conditions governing loading may vary considerably on different parts of the line. Concerning a boiler scheduled for shipment over a certain road during the late war, the following instructions went out: "Load the boiler on blocking on a depressed flat so that the extreme height does not exceed 19 feet 0 inches above top of rail. Move to Middletown and take out of train at East Yard. There block boiler about 1 foot 6 inches higher so that bottom of load is at least 4 feet 0 inches above top of rail. Move car to Leesville for delivery."

Where car ferries serve to transport trains across lakes or rivers, special factors have to be taken into consideration. There are pipes and frames overhead and posts alongside. If it is a 4-track ferry, the two outer ones curve sharply, which means that all the difficulties encountered on curves, as just described, also apply to them. It often happens that as many as five flatcars are to be moved without being uncoupled. Perhaps a long load rests on the second car and overhangs the first and third, while another on the fourth car extends over the third and fifth. In that case it is necessary to determine beforehand whether the track will accommodate all five. On a car ferry the overhead and side clearances are likely to differ at various places along the deck, and there will also be differences between boats if the railroad maintains a fleet. Therefore, instructions received from the engineering office may read as follows: "Carry on car ferry *Chief Tecumseh*, outside track only, at stern, placing with extreme caution."

Still another problem may be presented by a railroad tunnel, one under a river perhaps. There are bores in service today that were built nearly 60 years ago when present-day loads were undreamed of. These passageways are still safe, but their size may restrict the height of shipments to as little as 15 feet from top of rail. Accordingly, a line with such a tunnel is continually diverting high loads miles out of their normal course in order to get them over a river by ferry.

Not infrequently railroads hampered in this way study means by which old tunnels can be made to take loads of greater height than those for which they were constructed. One road considered spending a substantial sum to replace the



CHECKING CLEARANCES

An Erie Railroad "clearance" engineer measuring overhead and side room with a wooden form, mounted on top of a car, and an ordinary yardstick. Records of all "close fits" along the right of way are kept on file for ready reference when passing on special shipments. George C. Frank, assistant to the line's president, states: "We are especially proud of the fact that the Erie ranks as one of the top railroads for high and wide clearances and possesses heavy-duty equipment suitable for handling extra large shipments."

TUNNELS POSE PROBLEMS TOO

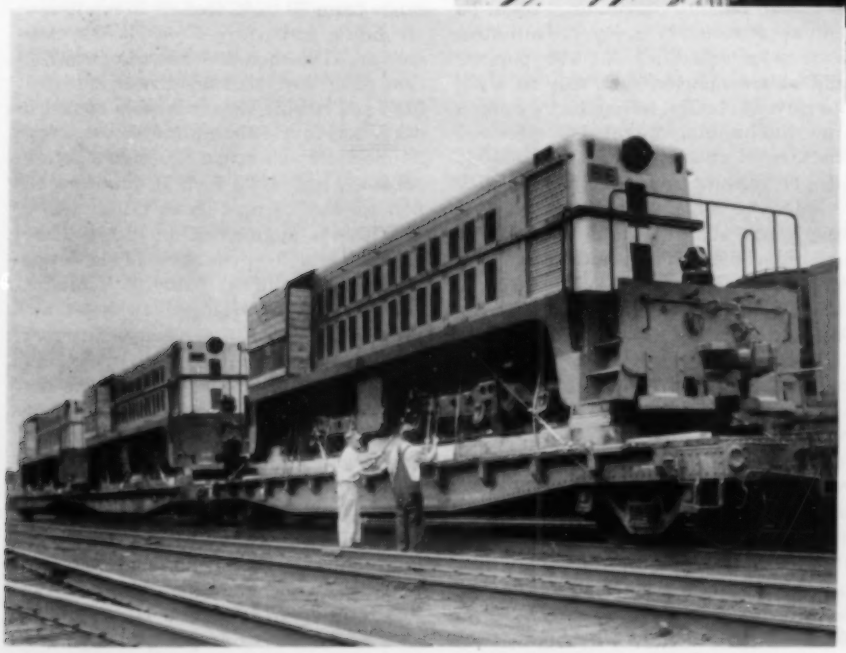
A diesel-powered freight on the Southern Railway emerges from a tunnel. With a view to passing extra-large loads, modern railroad bores are built with ample side and headroom. The floors of old ones have been lowered as much as 6 inches in order to increase top clearance.

existing 6-inch-high rail with a special, rolled type of equal strength only 4½ inches high. That would have increased the available height 1½ inches and was deemed worth the cost. Later, however, a full 6 inches was gained by designing and building a shallower floor system to support the track. That involved a much bigger expenditure but was considered a good investment.

In this matter of railroad clearances there is always some uncertainty to complicate decisions. Generally, 3 or 4 inches of clearance is as good as a foot, provided the engineers can be sure that the 3- or 4-inch leeway will actually be there. But a fast-moving car sways. Track maintenance men sometimes put in ballast lifts without informing the engineering department. Frost may raise the track in winter. Therefore engineers are sometimes in doubt about clearances and have to play safe by insisting on a margin.

Even with the best records and diagrams that can be kept under the circumstances, much still depends upon the knowledge, the judgment, and the caution of someone on the engineering staff. To a certain extent it is in his head. There is at least one instance where such a man died suddenly on a vacation trip, taking with him valuable information possessed by none of his fellow workers.

An engineer who is entrusted with the acceptance or rejection of railroad loads on flatcars is always aware of his great responsibility. He never fails to consult his conscience and never lets opinion sway him—always exercises utmost care. When he puts his stamp of approval on a load, he adds specific restrictions written with clarity and exactness. He has a second person check the instructions before they go out. Then, perhaps days or even weeks later, in the dead of night, that particular shipment speeds under a low bridge or past a close girder with only the necessary few inches to spare.

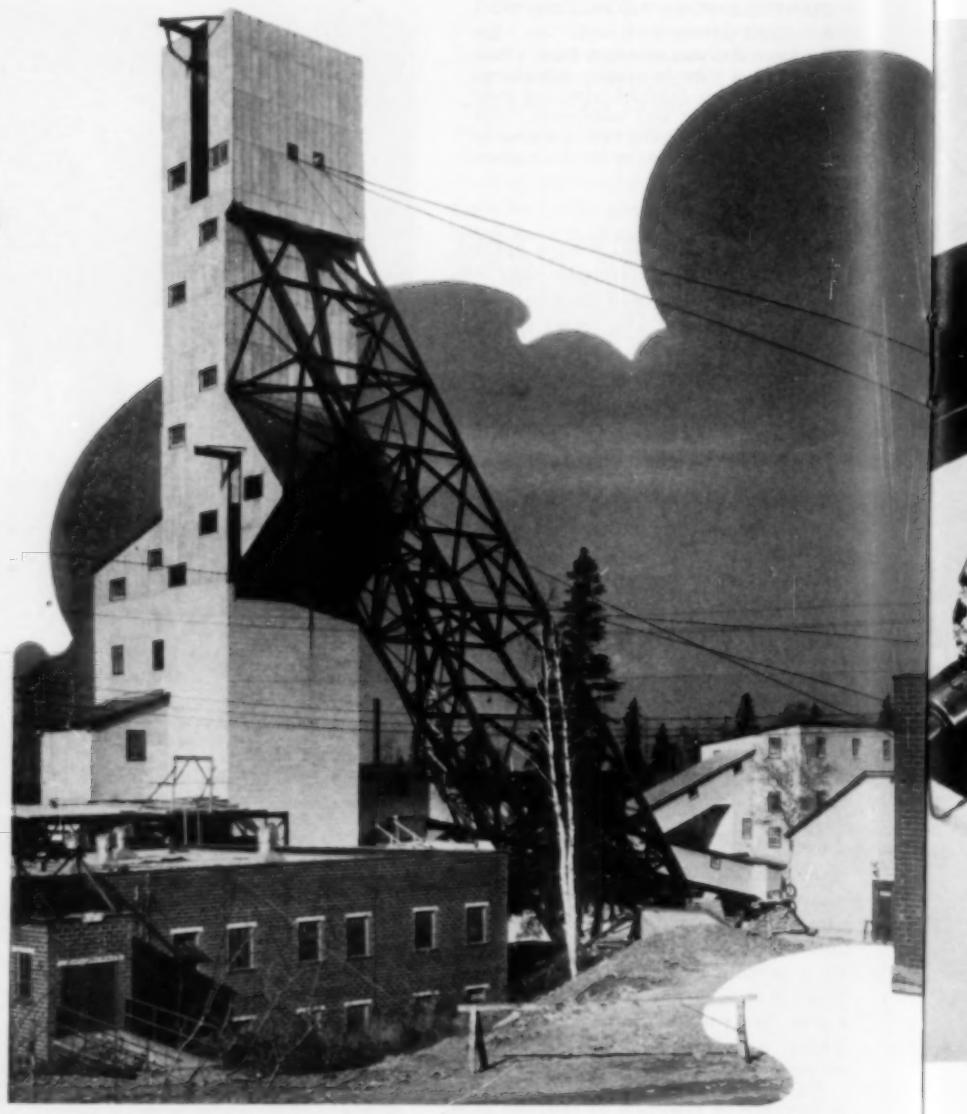


DIESELS TAKE A RIDE

Three locomotives destined for foreign delivery arriving at the Erie Railroad terminal in Jersey City, N.J., last July for loading on an outbound ship.

Powerful Hoist Serves Canadian Gold Mine

New Electric-driven Unit at Kerr-Addison Will Lift 420 Tons of Ore an Hour from Depth of 4000 Feet

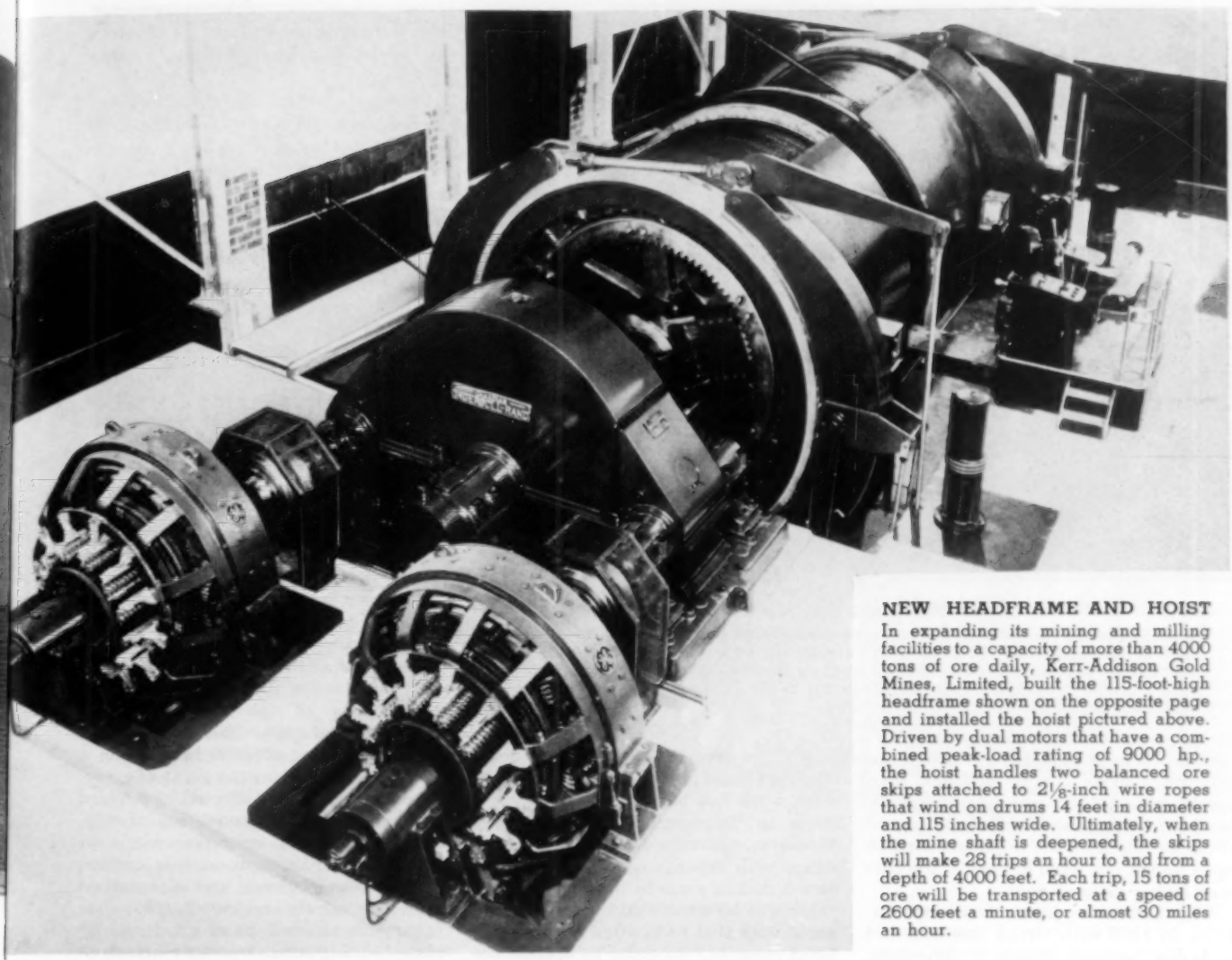


ONE of the most powerful mine hoists ever built is now in service at Kerr-Addison Gold Mines, Limited, located at Virginiatown near Kirkland Lake in northern Ontario, Canada. Having a rope-pull rating of 85,000 pounds, it is believed that it exceeds in capacity any other electric hoist in the western hemisphere and perhaps in the world. At present it is lifting 12-ton-capacity ore skips, in balance, from a depth of 2800 feet at a speed of 1500 feet per minute. Eventually, as the mine is deepened, it will handle 15-ton loads of ore from a depth of 4000 feet at a speed of 2600 feet per minute. This will enable the mine to maintain a schedule of approximately 28 skip trips per hour and to raise 5000 tons of ore in twelve hours, or 35,000 tons per week. In addition to the weight of the ore, the hoist will be handling 33,000 pounds of 2⅛-inch wire rope, plus the 18,600-pound weight of the skips.

Inasmuch as mine shafts and building elevator shafts provide means for vertical transporation, it is interesting to translate the capacity of the Kerr-Addison hoist into terms of skyscraper-elevator performance. Actually, if its skips were large enough to hold them, the mine lifting mechanism could carry 200 persons averaging 150 pounds in weight at one time. Assuming that passengers could be loaded and unloaded as fast as the ore (in approximately 36 seconds), a trip to the top of the 1250-foot Empire State Building in New York City, with the skip in balance descending, could be made approximately every 1.1 minutes. On such a schedule, 261,600 persons could be transported each way in a 24-hour day. Actually, to handle its human cargo, the building operates 65 elevators which travel at a maximum rate of 1000 feet per minute. For those who like statistics, we might add that the structure weighs about 305,000 tons. If it were reduced to rubble and dumped to the bottom of the Kerr-Addison Mine it could be loaded and hoisted to the surface in less than 31 days.

Installation of the Kerr-Addison hoist was one step in an expansion program that has made the mine one of the largest ore producers among the gold mines of North America. The principal part of the project consisted in enlarging the cyanide-process ore-treatment mill sufficiently to double its capacity. It is now rated at 4200 tons a day but is treating about 4300 tons. Additions to the mill buildings increased their ground dimensions to 283x253 feet. In height, they range from 50 to 62 feet or, in relation to an office structure, from six to eight stories. Also included was the construction of a new mine headframe 115 feet high and having sheave wheels 14 feet in diameter, four 48-man bunkhouses, four 24-man sleep camps, a 320-man cafeteria cookery, and 1000 feet of tunnels connecting the various plant buildings.

With its augmented facilities, Kerr-Addison is still a little short of the capacity of the Hollinger Mine at Timmins, Ont., which is equipped to hoist and process 5000 tons of ore daily. However, Hollinger is operating below capacity and Kerr-Addison is currently the biggest producer in point of tonnage among Canada's gold mines. In gold output it now about equals the Homestake Mine in South Dakota. The latter, with a capacity of 3900 tons daily, is running at around 2300 tons. As its ore averages approximately $14 per ton in gold content, that gives it an annual production worth about $11,000,000. Kerr-Addison gets almost the same amount of gold by



NEW HEADFRAME AND HOIST
In expanding its mining and milling facilities to a capacity of more than 4000 tons of ore daily, Kerr-Addison Gold Mines, Limited, built the 115-foot-high headframe shown on the opposite page and installed the hoist pictured above. Driven by dual motors that have a combined peak-load rating of 9000 hp., the hoist handles two balanced ore skips attached to 2⅛-inch wire ropes that wind on drums 14 feet in diameter and 115 inches wide. Ultimately, when the mine shaft is deepened, the skips will make 28 trips an hour to and from a depth of 4000 feet. Each trip, 15 tons of ore will be transported at a speed of 2600 feet a minute, or almost 30 miles an hour.

treating a larger quantity of ore that runs around $7 per ton in gold value.

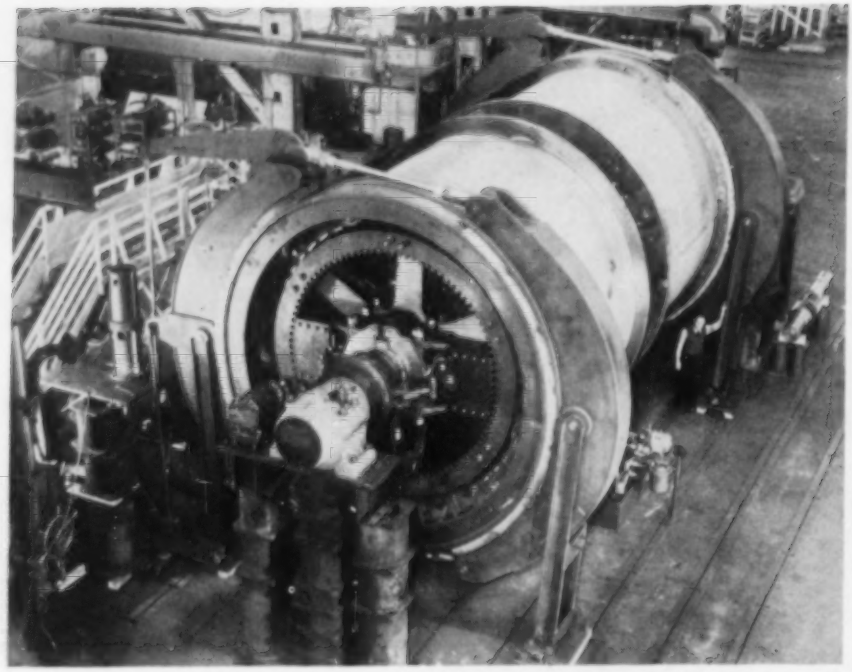
Kerr-Addison's profits per ton rose markedly when output was stepped up because unit costs went down. During 1949, the first full year of increased production, 1,560,195 tons of ore were mined, hoisted, and milled at the remarkably low cost of $2.79 a ton. In 1948, with a tonnage of 889,711, costs were $3.63 a ton. Profit, after deducting taxes and depreciation, was $3,854,124 in 1949, as compared with $1,640,358 in 1948. Low mining costs are possible primarily because of the great size of the ore bodies. Widths of 50 feet are common, and they range up to 200 feet. This provides plenty of working room and permits a high degree of mechanization.

It is said that a shovel is rarely seen in use. Ore is trammed in 6-ton cars and most of it is routed to two main crushing stations on the 1300 and 2500 levels. After being crushed, it goes into pockets from which it is loaded into the skips for hoisting. Operating at a daily rate of 4000 tons, the mine consumes approximately 12,500 hp. of electrical energy. This normally comes in over transmission lines and is generated in hydroelectric plants. In 1948, when a water shortage curtailed the power supply, the mine put in service a 1000-hp. diesel engine that had been aboard a United States submarine and was able to maintain its production schedule.

Although it now ranks as a firmly established mine, Kerr-Addison's early history was a stormy one. It was discovered during the Larder Lake gold rush in 1906, but never showed a profit until the late 1930's. During the intervening years it passed through so many reorganizations and its financing was so varied and complicated that the complete story of its corporate life is difficult to trace. Time and again technical men, representing prospective financiers, turned the property down because of its low gold content. As underground exploration proceeded, ore bodies estimated to contain 25,000,000 tons of ore were indicated, but at the price then offered for gold they averaged only $4 a ton in value. When the price was raised from $20.67 to $35 an ounce in 1933, the value per ton automatically increased to $7, and interest in the deposits was renewed. But it was clear that profitable operation depended upon large-scale production, and development was planned accordingly.

The initial Larder Lake excitement was created by the finding in the greenish dolomite country rock of quartz veinlets carrying small amounts of high-grade gold ore. More than 7000 claims were staked and two stamp mills were erected, but by 1910 all activity had ceased. In 1911, Goldfields, Limited, acquired the three most promising claims, including what is now Kerr-Addison ground, and spent $1,000,000 in unsuccessful attempts to develop paying ore. Some gold was of course obtained, and it is reported that the metal for the first gold coins minted in Canada came from this area.

Interest in the district was kept alive largely by the persistence of Jack Costello, who had been there from the beginning and believed in its future. Considering the leanness of the ore, however, it is a wonder that successive owners con-



WINDING DRUMS

A picture of the two 168x115-inch winding drums taken while the hoist was being built in the Sherbrooke, Que., shops of Canadian Ingersoll-Rand Company, Limited. On the near end is one of the unit's two oil-operated internal expanding jaw-type clutches. An indication of the hugeness of the drums is given by the man standing alongside.

tinued their efforts long enough to eventually make a mine. Mining men express doubt that, were the discovery to be made today, sufficient capital could be raised on the initial showing to open up the ore, even in view of the current higher price of gold.

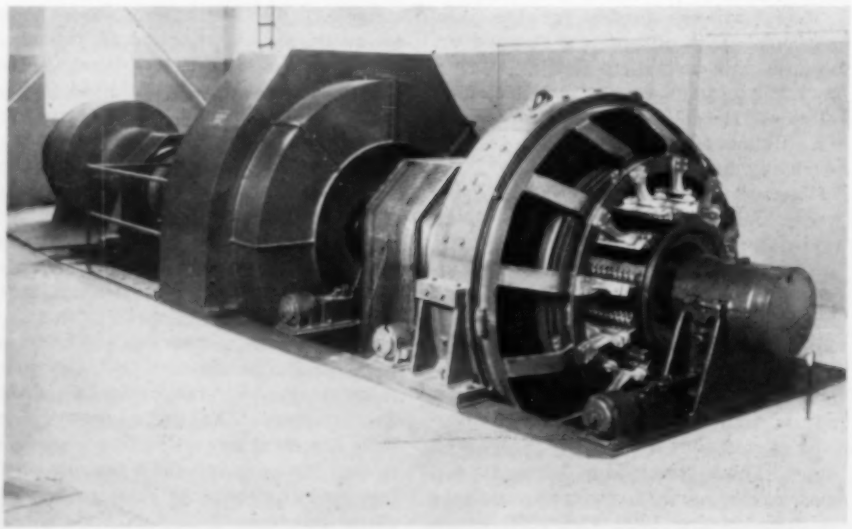
The present company was incorporated in 1936 with strong financial and technical backing. James Y. Murdoch, Kerr-Addison president, is also president of Noranda Mines, Limited, one of Canada's greatest and richest mineral producers. André Dorfman is vice-president, as well as president of Anglo-Huronian, Limited, a holding company that has extensive Canadian mining interests. W. S. Row is mine manager. Under the aegis of this new management, a 500-ton mill was started up in 1938 and was increased in capacity to 1200 tons in 1939 and to 2250 tons in 1941. In the decade 1938-48, the mine treated 5,794,237 tons of ore averaging $7.34 in gold content per ton. With costs held to $3.20 a ton, profits totaled $23,973,662. The company was able to pay dividends of $11,350,000, put more than $3,000,000 in plant and equipment, and retain enough money to finance the recent $5,400,000 expansion program.

As the mine is still a shallow one, compared with Canada's other leading gold producers, a long life is forecast for it. Virtually all ore extracted so far has come from above the 1600 level. In reporting ore reserves, the company lists only those extending to a depth of 1450 feet, and they currently exceed 8,000,000 tons. However, the main shaft is down 2650 feet and a great amount of development work has been done at the lower levels in preparation for the future. Moreover, the ore appears to be growing richer with depth, and it is freely predicted that in years to come the average value will be around $10 a ton as compared with that of $7.70 assigned to the listed reserves. In order to operate the mine effectively, considerable quantities of subaverage ore are being extracted from the upper levels, and this accounts for the $6.65 average reported for the 1949 output.

In order to exploit the lower horizons, the company will soon deepen the main shaft to 3850 feet and the new hoist was purchased with that in view. It was put in use in July, 1948, when the mill capacity was only 2250 tons a day. In October of that year milling was stepped up to 3200 tons and in the following December to 4000 tons.

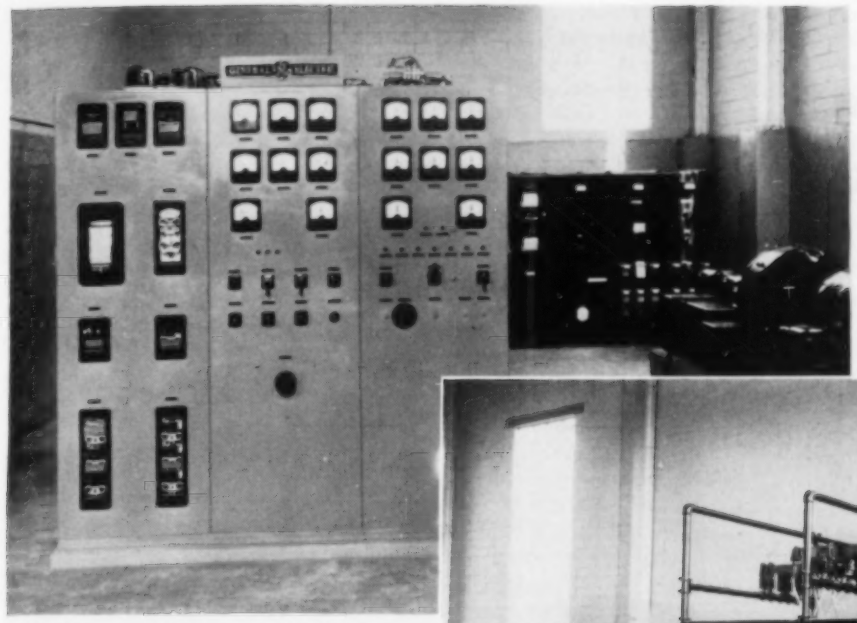
The following description of the new hoist was written by George M. Dick, manager of engineering for Canadian Ingersoll-Rand Company, Limited, which built the huge piece of precision machinery in its shops at Sherbrooke, Quebec. To meet the exacting requirements of the service for which it was intended, the unit had to be engineered along very substantial lines and all design features involved were selected after a thorough investigation by the interested parties.

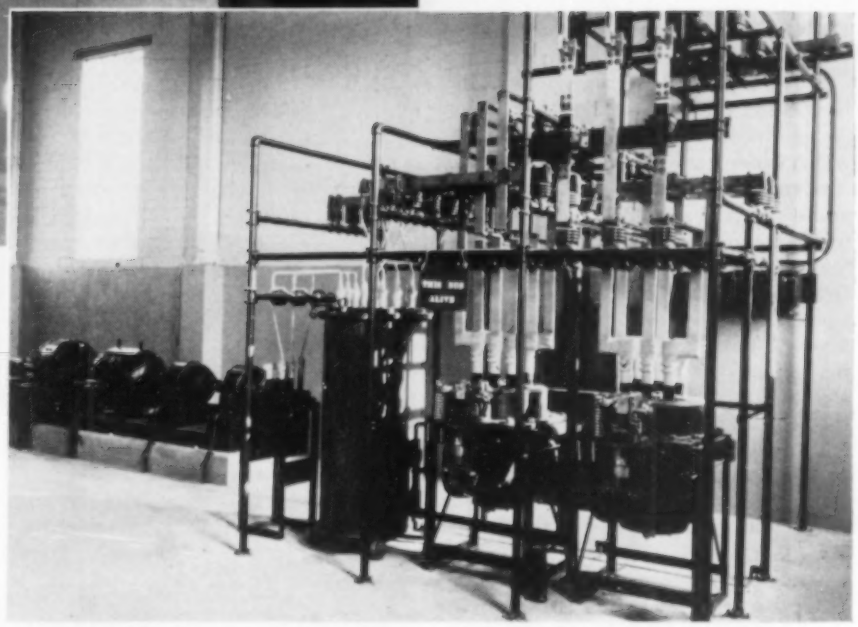
The hoist is operated by two Canadian General Electric 2250-hp. direct-current motors flexibly coupled to pinion shafts on each side of the main gear, providing dual pinion drive. The cut-steel gear and pinions are of the single-reduction, double, helical type. Each motor has a peak-load rating of 4500 hp., giving a total of 9000 hp. at the point of greatest duty. Control is effected by a Ward Leonard amplidyne consisting of a 2-unit synchronous motor-generator set and an induction-motor-driven exciter, plus necessary direct- and alternating-current controls and switchgear. Another generator will be added when ultimate hoisting conditions are reached. A feature of the electric equipment are the



MOTOR-GENERATOR SET

This equipment for the Ward Leonard amplidyne control of the hoist motors consists of a Canadian General Electric 5000-hp., alternating-current, synchronous motor that drives a separately excited 1750-kw., direct-current generator. Another generator will be added when the ultimate hoisting depth is reached.





SWITCH GEAR AND CONTROL PANEL

At the right is shown the open-type switch gear and auxiliary motor-generator set for the Ward Leonard electrical control equipment. The duplex type (a.c.-d.c.) control panel is pictured above.

duplicate armatures in the hoist motors and generators which, together with the synchronous motor, all use the same size bearing. The electrical components are fully protected against incorrect operation and emergencies of all kinds.

Each drum is controlled and driven by a clutch of the internal expanding jaw type. The driving member of this clutch is keyed and clamped to the drum shaft while the exterior member, in the form of an internal ring gear, is rigidly bolted to the drum flange. There are two sliding jaws in each clutch, and the external teeth on their outer ends engage with the teeth of the internal ring gear. The jaws are constrained to move radially through a rocker shaft actuated from an oil cylinder. The drums are constructed in such a way that each flange forms a part of the drum barrel or rope tread the center section of which consists of heavy steel plate internally reinforced with steel stiffening rings. The barrels are attached to the flanges by means of large fitted bolts.

The drum shaft is supported in four large babbitt-lined bearings, one of which is provided with a thrust arrangement. The bearings of the pinion shaft also are babbitt lined. The pressure lubrication system has sight-flow fittings so that suitable inspection can be made at all times to insure proper oil distribution to each bearing.

The post-type brakes which constitute the main braking devices are of heavy welded steel construction and arranged to form a parallel-motion system. No castings are used in the brake mechanism, thereby eliminating any possibility of failure by reason of low tensile strength.

The hoist is completely equipped with safety devices including Lilly controllers which prevent overspeeding, overwinding, and faulty retardation. Other safety equipment is provided to give men added protection when traveling. There are also brake regulator valves which, in conjunction with the Lilly controllers, regulate the speed at which the brakes set on emergency stops, thus making sure that the skips will be brought to rest more slowly when in midtravel than when at the extreme ends. A simplified emergency-brake resetting mechanism is furnished so that by moving the brake hand lever on the operator's platform a short distance beyond the normal "brake-on" position the entire safety system is again reset. This precludes the possibility of inadvertently allowing the hoist to start after an emergency stop and makes special resetting mechanisms unnecessary.

The hoist operator's station is in the form of an enclosed platform-desk control. The hand levers are conveniently grouped and are of such length that they can be shifted in either a standing or sitting position. A pivoted chair is designed so that the operator can push it away if he desires to control the machine standing. This arrangement counteracts any tendency towards sleepiness engendered by having to stay in one position for the duty period. The full-length hand levers serve the same purpose because they require a reasonable amount of physical movement on the part of the hoistman.

On the platform are located desk compartments and a dashboard for the accommodation of brake control valves, signal buttons, emergency switches, back-out switches, pressure gauges, ammeters, tachometers, and indicating lights to signify various operating conditions. Illuminated depth-indicator dials are assembled conveniently on the desk tops, angled so as to suit the operator's vision and to enable him to interpret with ease the positions of the skips in the mine-shaft compartments. The Lilly controllers are neatly assembled under the dashboard, combining in one unit all the important operating features of this machine.

The installation of this outstanding hoist reflects not only the present high state of mining development in Canada but also the existence of first-class engineering and manufacturing facilities that have grown up to serve the mines.

Harnessing Britain's Gales

Arthur Middleton

THE sun is rising on a new era in power production in Britain. To supply more electricity to light her homes and run her factories that nation is engaged in a scheme to tap the gales which sweep across it from the Atlantic. An experiment to harness the wind on a grand scale has already been blueprinted, and tests are at present in progress on the island of Pomona in the Orkneys. A 100-kw. aeroturbine of advanced design is to be built there as the first of a number of windmills envisaged for various coastal areas. Cables linking the site to the Kirkwall power station on the Scottish mainland have recently been laid, and the current generated by the turbine will be fed into the existing network which supplies electricity to the cities, towns, and villages of the United Kingdom.

Other wind-driven generators are proposed for the Shetlands, the western shores of the mainland, and the southwest shore of England. Weather records covering a long period have been examined in order to assess the potential energy from this source and to discover the best sites for the new windmills. Meteorologists have lived for several months on some of the islands off the coast of Scotland to obtain reliable data, and the locations provisionally chosen as a result of these investigations are noted for their steady winds rather than for gusts of short duration.

In designing the aeroturbines, Britain's electrical engineers have studied experiments with generators of this type in the United States and elsewhere. The Smith-Putnam wind-driven turbine on Grandpa's Knob in Vermont, which ran from 1941 to 1945 and developed up to 1500 kw. at a wind velocity of 70 miles an hour, has come in for special notice, and lessons have also been learned from smaller Danish units.

England has had windmills of the orthodox type with canvas-covered or slatted sails for centuries. More than 100 of these structures still operate throughout the countryside, grinding grain or cutting cattle cake. Though their number was dwindling, steps are now being taken to keep them working—even to repair some that have fallen into disuse. In the case of the modern windmill, however, the technicians have thrown aside the old idea of great sails for the much more efficient aeroturbine with a 3-bladed propeller, like that on an airplane. Measuring 60 feet from tip to tip, and mounted on a 100-foot pylon 500 feet above sea level, it is designed to produce at least 2000 kw. That's roughly one thousand times the output of any generator of this type yet built in Britain.

OLD BRITISH WINDMILLS

The mill shown just above occupies a site at Lytham in Lancashire, England, on which there has been a succession of such structures since the year 1190. That was only shortly after the first mills of authentic record were erected in Germany and the Netherlands. The 5-sail mill pictured at the top is still grinding grain in Boston, the principal town in Lincolnshire from which came the Puritans who founded Boston, Mass.

Equally important as supplying electricity is coal conservation. In a preliminary report published by the Electrical Research Association, which appointed a committee in January, 1948, to study the technical and economical aspects of large-scale wind-power generation, we are told that several hundred installations capable of developing between 3750 million and 7500 million kilowatt-hours annually might make it possible to save from two to four million tons of coal The report goes on to say that further economies in this direction can be effected by putting Scotland's hydroelectric resources to work in partnership with wind power.

Even while the war was in progress, electrical engineers and surveyors were preparing for a big postwar demand for current for home and industrial use throughout the land. They covered 10,000 square miles in Scotland, measured the amount of water in the lochs and rivers, studied rainfall records, and translated this knowledge into terms of electricity. Then they formulated the plans which are now being carried out.

Indeed, no fewer than 97 hydroelectric projects are being pushed or are scheduled for development in the near future! Seventeen major schemes are well advanced, and more than $300,000,000 has been earmarked by the Exchequer for the whole series. The biggest undertaking, already nearing completion, accounts for $20,000,000 and entails driving a tunnel straight through the heart of the mountains separating Loch Sloy from a big new power station near the shores of song-famed Loch Lomond. The bore will allow the pent-up waters of Loch Sloy to rush through 10-foot pipes and step up the electric energy supplied Scotland and northern England by 130,000 kw.

In other parts of the Highlands vast sums are to be spent not only in tapping the potential power of the lochs but also in raising the water level so as to insure maximum output. Mountain streams are being enlisted as well, for their waters are being trapped and led directly into the lochs so that none shall run to waste. In Argyllshire and certain other regions the torrents will be made to do double duty. They will generate current at one point near an artificial loch and will then be released to turn more turbines at the head of Loch Lomond.

Will the scenic charm of the Scottish Highlands be destroyed through this extensive waterpower development? No, say the planners, they will not lose their natural beauty nor be denied a place in Britain's plans under which her national parks are to be safeguarded for posterity. Care is being taken to preserve the amenities by screening the pipe lines and power plants. For the same reason some of the turbines will be housed underground.

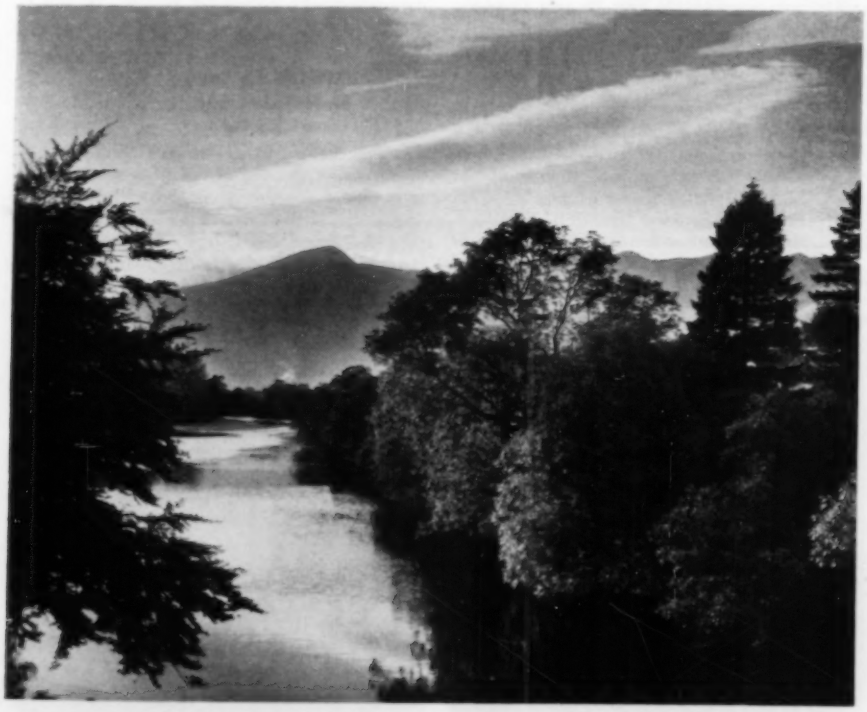
Compared with these widespread projects to harness the wind and lochs, the tying of Britain's old windmills into the economic scheme seems a minor matter. Yet that is, nonetheless, an entertaining story. The ancient structures, many of them fast going to ruin, were surveyed during the war in order to decide which of them might be recruited into the country's agricultural program. Those that could be restored quickly were made to work again; others, still in operation, were given priority in repair materials so that they could keep on running.

These giants of the landscape did much to relieve the steam- and electric-driven grain mills which were very hard pressed to deal with the greatly increased quantities of wheat grown by the English farmer. Since the cessation of hostilities they have continued to serve Britain in that way with the result that interest has been shown in their conservation for sentimental and historical reasons. It is a far cry from the halcyon days of windmilling to the scientifically designed aeroturbine of today, for English breezes were first put to work more than 700 years ago.

What is probably the oldest mill site in the entire country is at Lytham on the Lancashire coast. A windmill is believed to have been built there in 1190 and may, reasonably, be regarded as the starting point of the schemes to harness Britain's gales. At Outwood, Surrey, stands a windmill that dates back to 1665. Moreover, it is still turning. Others put up later are fine specimens of the miller's craft. A 5-sailed mill goes on grinding grain at Boston, Lincolnshire, and there was one on the same site when the Pilgrim Fathers were imprisoned in the town's guildhall. Even Yorkshire and Lancashire, which are generally considered industrial counties, have old windmills in working order.

TYPICAL FARM AEROTURBINE

World War I demonstrated the need of additional sources of power in the British Isles and led the Institute of Agricultural Engineering, University of Oxford, to investigate wind-driven electric generators in 1924-25. Eight sets, ranging in capacity from three-tenths kilowatt to 10 kw. were built and tested. They had airplane-propeller-type wheels 29½ feet in maximum diameter mounted on towers up to 60 feet high. As a result of this work, some small units such as the one shown here are in use on farms. The aim of the present movement is to set up similar but much larger plants to save coal.

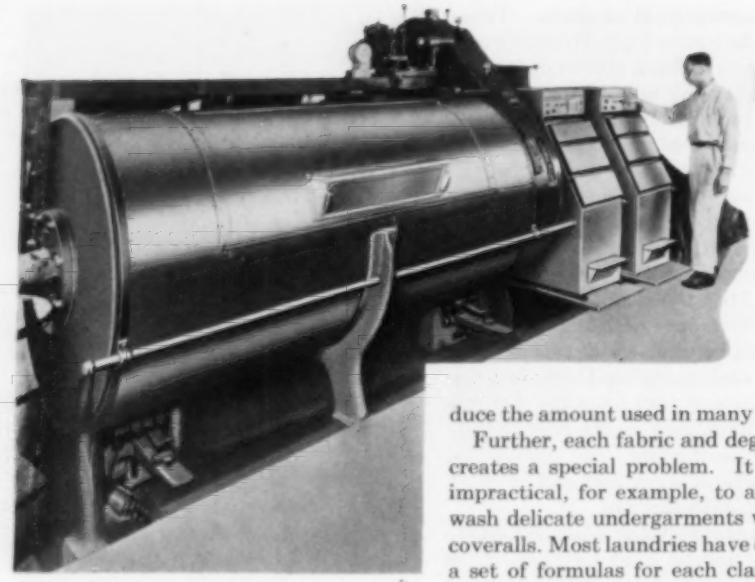


POTENTIAL POWER IN THE SCOTTISH HIGHLANDS

In addition to harnessing its windpower, Britain has undertaken a large-scale hydroelectric scheme in the north of Scotland to tap the waters in its numerous lakes and rivers. Seventeen different projects are under construction now, and 80 others remain to be developed. The view shows the River Orchy, in Argyllshire, with Ben Cruachan (3689 feet high) in the distance.

Learned societies in Britain are now pressing for the preservation of these attractive landmarks that have survived 200 years and more, and in a number of cases funds for their purchase or upkeep have been raised. So much sentiment attaches to them that even some of those that cannot be made to operate again are being restored. The villagers of Finchingfield, Essex, have repaired a local windmill by their own labors and at their own expense, though it has been idle for 100 years.

And a mill with four sails still stands on the spot foursquare to the winds which sweep in from the Atlantic and which will presently be turning large aerogenerators. When this method of developing electricity is fully established in Scotland and other parts of the United Kingdom that country will have striking examples of how the wind has been harnessed for centuries past and how it is being tapped today to boost the national supply of electric power.



Laundry Washer Has Automatic Air Controls

A. M. Brodine

AIR operation is a salient feature of The American Laundry Machinery Company's Cascade Automatic Washing Control, a unit that regulates water level, temperature, and washing time for each bath; injects measured amounts of soap, bluing, and bleach at the correct intervals; changes the water after each bath; and stops the washer at the completion of the cycle.

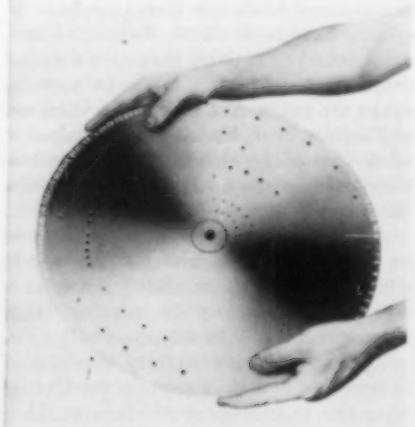
Need for such a control system became apparent when a study of standard laundry practices showed that washmen normally perform as many as 62 separate operations in handling each load. These entail adding washing supplies by hand, opening and closing water inlet and drain valves, adjusting temperatures by manually controlled steam valves, and setting water levels for from eight to ten baths. Frequently a man is in charge of several machines. Using conventional equipment, he is often so busy that water is allowed to flow into a washer until a splash from the tub warns him to shut it off. Prompt closing of valves would reduce the amount used in many laundries.

Further, each fabric and degree of soil creates a special problem. It would be impractical, for example, to attempt to wash delicate undergarments with dirty coveralls. Most laundries have developed a set of formulas for each classification they customarily handle. Once established, they should be rigidly followed to insure uniformly good results. To overcome hit-and-miss methods, the American Laundry Machinery Company designed its automatic indexing mechanism which, by the ingenious use of air power, makes it possible to repeat each formula indefinitely and without deviation. It operates on a pressure range of 65 to 85 psi., and consumes 10 cubic feet of air at 70 psi. with a $\frac{3}{8}$-inch pipe connection.

But before the control (shown at the right in top picture) can be put in service, it is necessary to provide "formula plates," metal disks punched with holes by aid of a special fixture according to the sequence of operations involved in each of the varied washing cycles. By repeating certain perforations in a plate a particular operation can be carried out for any required number of minutes. A different plate is used for each classification, and changing from one to another takes but a few seconds. When a washing formula is to be repeated, the disk is returned by hand to the starting position.

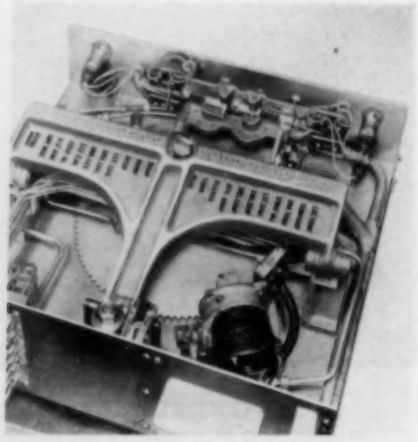
As soon as the control is actuated by push button, the formula plate begins to rotate on a sprocket that is driven by a geared-head timing motor and advances one tooth at a time at one-minute intervals. With each advance, a master air valve opens to lower an indexing yoke. This brings a row of pins on the yoke in contact with the formula plate. Where a pin is in line with a perforation, it passes through the hole and opens a valve beneath it. The latter releases compressed air which then performs the operation represented by that particular hole in the disk.

Water is admitted automatically into a common mixing chamber by two valves functioning singly or in combination to provide either hot or cold water or water of any desired temperature to meet the requirements imposed by the formula plate. Water level in the washer is controlled by the use of a tank containing an open-bottom float. When water is to be admitted up to a certain point, a perforation in the disk registers with the indexing valve for that particular level. This valve causes air to flow to the control head on the float tank, lowering a level-indicating finger and setting it for the depth of bath desired. Rotation of the plate to the next stage in the cycle brings the water-inlet valves into action.



"Heart" of the air-operated automatic control is the formula plate, a metal disk which looks like a phonograph record.

This fixture permits perforating formula plates in the laundry in accordance with the schedule of operations in the cycle.



The formula plate is placed beneath this T-shaped indexing yoke which contacts the perforated disk once a minute.

When the bath has reached the correct level, one of three vertical rods in the float trips the preset level-indicating finger and automatically shuts off the air—closes the water-inlet valve.

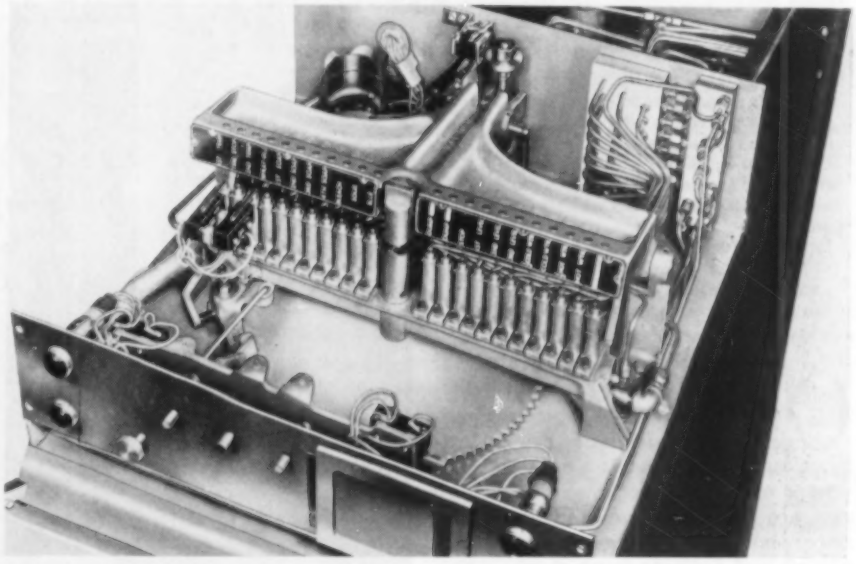
A "thermo-thermometer," mounted on the washer, registers the temperature of each bath. It has two microswitches in its housing that can be set in accordance with requirements. When the formula plate indexes a given temperature, current to the timing motor is shut off and the control unit stops temporarily. After the water has reached the degree for which the particular microswitch is set, the steam valve automatically closes, cutting off the flow to the washer. Then contact with the timing motor is reëstablished and the control starts to function again.

The water is drained at a predetermined time also by the aid of the indexing yoke and formula plate. Upon contact with the corresponding pins, outlet valves admit air to pneumatic cylinders which, in turn, actuate "dump" valves on the washer. Immediately upon the discharge of one bath another enters, thus preventing time lags and saving power between successive operations.

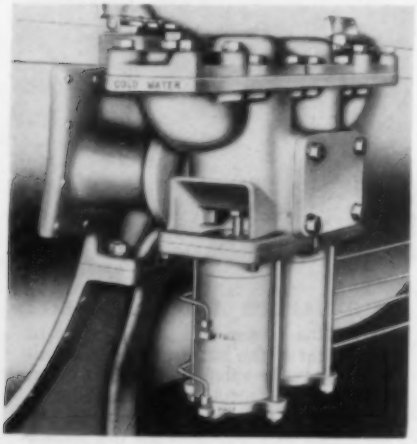
Soap, detergents, bleach, sour, and blue are injected into the water by steam, and each is stored in a special tank which is regulated by the control unit to supply the proper amount of each at the right time. Simultaneously with the introduction of soap into the washer, a receiving tank is flushed out with water by use of an air valve.

Not only does the system relieve the washman of the job of attending to the machine, but it whistles to him when the laundry is done. Upon completion of the formula, a perforation in the plate registers with the "stop" valve. Instantly, the timing motor on the control is switched off, a red light goes on, and the whistle blows, signaling the operator that the load is ready to be removed.

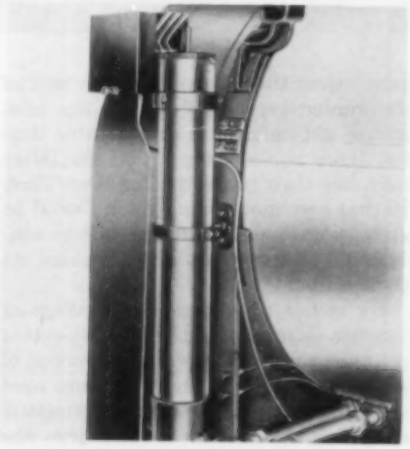
With the American Laundry Machinery Company's air-operated control the washman has to perform only three operations: fill the supply compartments, insert the formula plate, and start the control. It even whistles to him when the wash is done.



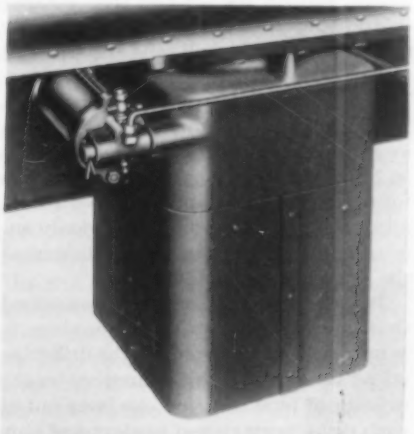
The "brains" of the Cascade Automatic Washing Control is this indexing head with 22 air-operated valves which automatically and precisely perform 59 of the 62 operations which a washman must do when using a hand-controlled machine.



Inlet valves, operated by separate air cylinders, admit water at the temperature predetermined by the formula plate.



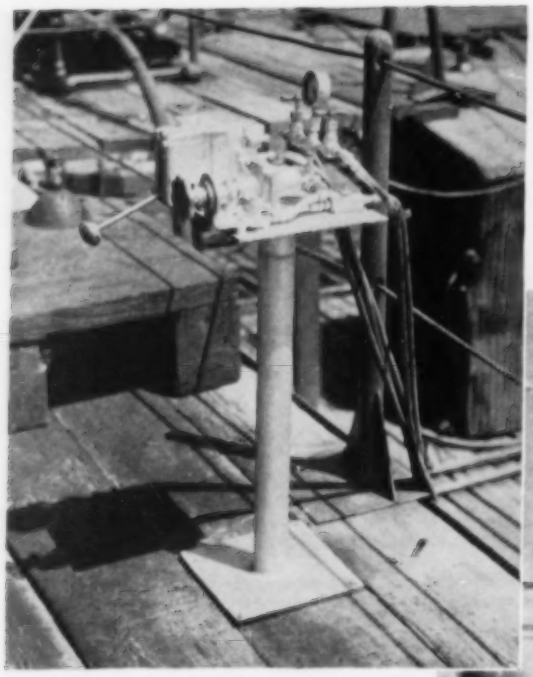
Water level is regulated by an open-bottomed float tank and a control head with three level-indicating fingers.



Air-operated outlet valves instantly drain each bath from the washer at the precise time called for by the formula.

Air Controls Mud Flow in Drilling Oil Wells

Elton Sterrett



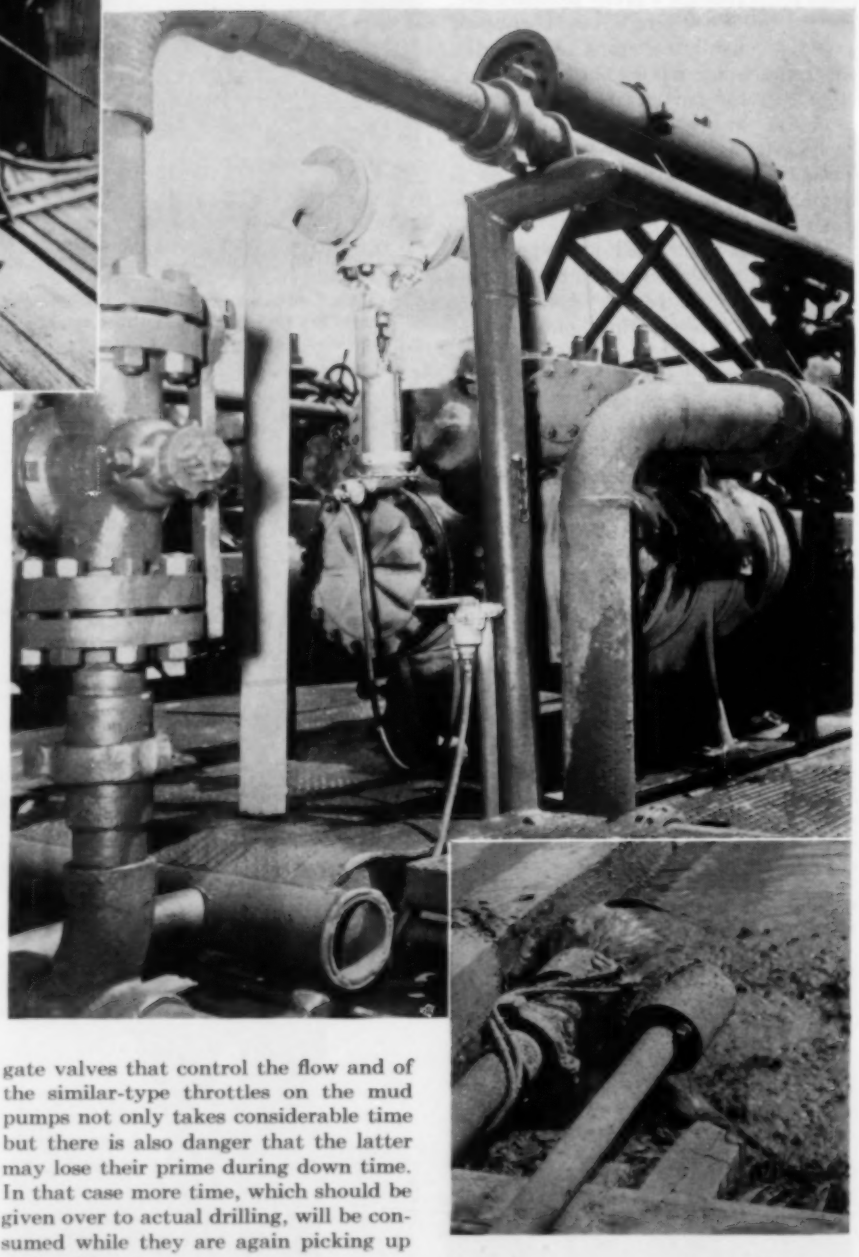
OPERATOR'S STAND

This pedestal is set up at a point that gives the operator a clear view of the mud pumps, slush pits, and the pressure relief valve that recycles the mud in and out of the pits while the drill-pipe string is broken. The main control valve is shown at the left with its weighted handle in operating position. On the near side of the stand is the idling speed-control wheel. Mounted above and at the right is a gauge that shows the air-line pressure.

COMPRESSED air, which furnishes the modern oil-well rotary drilling rig* with numerous mechanical muscles, is now used to control mud pumps as well as the flow of the high-pressure stream of mud and has eliminated one of the few remaining time-consuming and back-straining chores of the drilling-crew laborer, or "roughneck." The fluid is pumped down the well through the drill pipe. At the bottom, it passes through the bit and then returns to the surface by way of the annular space between the drill pipe and the well wall or casing, where the latter is present. The weighted and specially compounded mud lubricates the drilling bit, carries away its cuttings, supports the well walls to prevent them from caving where the formation is weak, and provides resistance to the pressure of any suddenly encountered flow of gas, thus minimizing the possibility of a blowout.

It has been conservatively estimated that, under normal drilling procedure, it is necessary while breaking the drill-pipe string for the addition of another length or joint of pipe to spend one hour out of each eight so employed to start and stop the mud pumps. Manual wheeling of the gate valves that control the flow and of the similar-type throttles on the mud pumps not only takes considerable time but there is also danger that the latter may lose their prime during down time. In that case more time, which should be given over to actual drilling, will be consumed while they are again picking up their prime.

By means of an ingenious linkage of throttle controls and a double-acting piston-actuated relief valve at the end of a branch line in the high-pressure mud system it is possible to slow the pumps to an idling speed and to discharge the pressurized mud into the slush pits. Simultaneously, the setup drains the rotary's hose and standpipe so that, when



MUD PUMPS AND DISCHARGE

Above the power end of the pump in the center of the large picture is a balanced throttle valve in the steam line. The manual control valve mounted on a post in the foreground serves to adjust the steam flow between the two pumps when they are being operated in series. The lower view shows mud discharging into a pit while it is being recycled to prevent the pumps from losing prime.

*See "Compressed Air, the Roughneck of Oil-Well Drilling" in Compressed Air Magazine, March, 1949.

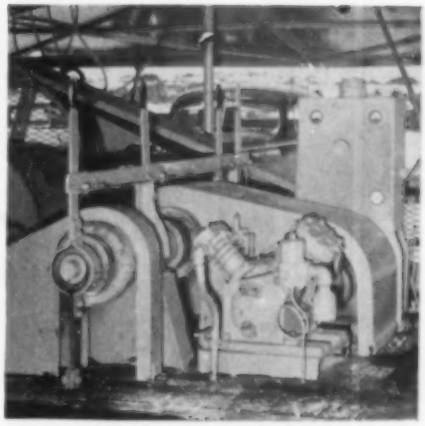
the topmost joint of the drilling string is broken, there is no head of mud to gush out and flood the derrick floor in the vicinity of the rotary table. This saving in mud not only results in a much cleaner and safer working floor but also conserves from one to several barrels of the fluid which, when drilling deep wells in difficult formations, may involve a cost ranging from $25,000 to as much as $100,000 per well.

Control of the mud system is centralized in a small stand or pedestal erected at some point on the derrick floor where the driller or one of his crew commands full view of the mud pumps, the suction pits, and the discharge or relief valve. This stand carries the master regulating valve, with a 2-position handle that is depressed to pressurize the air-control lines and raised to vent the pressure when the system is to be changed from the normal pumping cycle. By arranging this air valve so that the down position of the handle represents the normal operating condition, gravity helps to insure proper setting of the unit and derrick vibration cannot change it.

The flow of steam to the power ends of the mud pumps is regulated by a 4-inch balanced throttle valve in the main steam line leading to each unit. Conveniently mounted on a post alongside each pump and interposed in the air line which serves to actuate the throttle is a manual control valve that may be set to give any desired maximum flow of steam to the pump. By adjusting the two hand-operated regulating valves, any balance may be established between the mud pumps so that when the mud flow is compounded—that is, forced through one unit into the other in order to obtain pressures higher than those possible with one pump—the proper speed and steam-flow relations are insured and the load is distributed evenly between the two units. Then, with the manual valves set, control of the air to the throttles is effected through the main or centralized valve on the derrick floor where the driller manipulates the pump-idling speed in conjunction with the master valve so that the pumps will continue to put up pressure and thus maintain full suction and discharge up to the point where a by-pass valve is opened. This raises the handle of the main control valve and at the same time cuts the pumps back from the maximum rate to the predetermined idling speed so that they are prevented from racing and pressurizing the full mud volume.

The accompanying schematic diagram depicts the linkage and the units required to secure the desired derrick flow control. High-pressure air in the system, which is maintained at 100 psi. gauge by the rig's compressor, is exhausted by quick-release valves "I" when the main-control-valve pressure is lowered. Pressure opposing the diaphragm "B" drops, allowing its spring-actuated return to operate a 4-way valve to stop the pumps or to cause a momentary pause.

Compressed air is then admitted by the 4-way valve "B" into the by-pass-valve relief line to open valve "C" and allow the mud stream to return to the slush pit. High pressure in the standpipe, such as might be caused by a gas "kick" in the formations penetrated by the bit or by the well getting out of control in some other way, acts to hold the by-pass valve in the closed or normal drilling position and thus prevents possible unloading of the well with disastrous results.



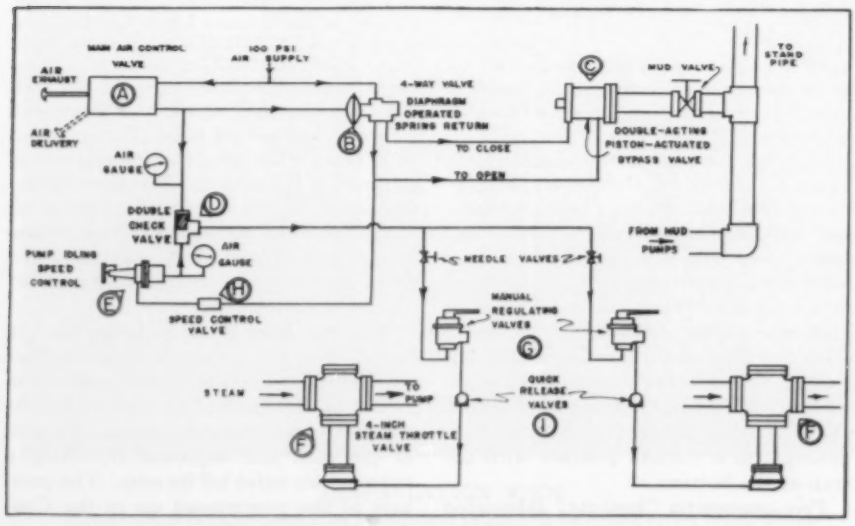
RIG COMPRESSOR

An Ingersoll-Rand air-cooled machine that furnishes compressed air for operating drill-rig auxiliaries and controlling mud pumps, as described in the accompanying article. The unit is belt-driven from a countershaft of the drilling equipment.

Air is simultaneously fed to the pump's idling-speed control valve "E" by which the normal 100-pound working pressure is reduced to around 20 pounds or some such value that will maintain the throttles at idling speed. That pressure is sufficient to actuate the double check valve "D" because the opposite side of the check plug is not subjected to pressure. Air at the reduced pressure reaches the spring-loaded throttle valves, causing them to open just enough to supply the amount of steam required to insure the predetermined number of idling strokes per minute. Varying the back pressure on the reducing valve "E" by turning the regulating hand wheel makes it possible to adjust the pressure of the steam delivered to the pumps from zero to full boiler pressure.

This description of the mud-system air control covers a steam drilling rig. The same type of control with air-actuated rheostat or other current regulating device would apply with equal force to an electrically operated drilling rig. Air-balanced diaphragms could, in the same manner, be incorporated in the throttle controls of internal-combustion engines used to power pumps driven individually by such engines, in fact, the effective working combination of mud-stream release and instant regulation of pump speed can be made available regardless of the type of prime mover involved.

In the mud-stream control we have another example of what forward-looking oil companies and drilling contractors are doing to eliminate fatiguing chores in oil-well drilling—to provide their highly trained crews with mechanical aids to do the heavy jobs and thus lengthen their service life and give them more opportunity to devote their time to supervisory work.

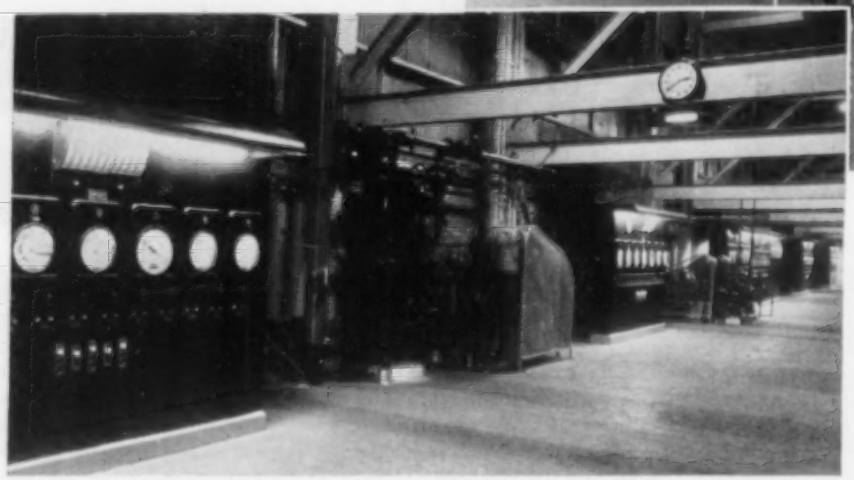


AIR-OPERATED CONTROL SYSTEM

Schematic diagram showing essential members of the mud-control hook-up, together with air lines and their linkage, that provides for the interlocking of by-pass and dump valves with steam throttles on the mud-pump power ends. With manual regulating valves positioned to meet normal operating conditions, manipulation of the main air-control valve alone governs the mud flow.

Meet the Condensifilter

For Use Where Extra Dry and Clean Air Is Needed



WHERE CONDENSIFILTERS ARE USED

Five steam-generating units in the new South Side boiler house of Jones & Laughlin Steel Corporation, Pittsburgh, Pa., do more work than 43 of an older type which they have replaced. The new units produce 1,000,000 pounds of steam an hour, making the plant the world's largest in point of capacity it is claimed. At the top is a front view of the boilers. The diagonal pipes deliver coal from overhead bunkers to the spreader stokers of the units, which can also be fired with steel-mill producer gas. Completely automatic operation is achieved by use of the pneumatic control instruments pictured above. The compressor-Condensifilter combination, which is located between the two nearest control panels, assures the delicate control instruments a dependable supply of clean, dry air.

EDITOR'S NOTE: Various devices and apparatus are available for the extraction of dirt and moisture from compressed air that is to be used for a limited number of purposes where unusually clean and dry air is required. The equipment used and the extent to which the air is treated depend upon the nature of the application. The following article describes a device that seems to have proved its efficiency under actual service conditions.

FOR most applications, compressed air must be freed of rust, scale, dirt, oil, and water before it can be used, and this is generally done by filters that catch the solids and by aftercoolers that condense oil and water vapors. But cleanness and dryness are relative terms. Air that may be satisfactory in one case will be far too dirty and moist in another. Take pneumatic control instruments that regulate a wide variety of industrial processes. These sensitive, delicate devices can easily be put out of order by the condensation of a minute amount of water vapor in their inner workings, by a tiny drop of oil, or by a speck of dirt too small to be seen. Air fed to them must be far cleaner and drier than that supplied air-powered punch presses or similar equipment.

That is where the Condensifilter comes in. Made by Hankison Corporation, it acts both as a filter and condenser and supplements standard filters and aftercoolers where the air must be exceptionally clean and dry. Cylindrical in appearance, it is about 8 inches in diameter and 57 inches long. It has a central hollow shaft carrying a filtering section, a condensing section, and a moisture trap. Top and bottom heads and a metal housing complete the unit. It is mounted in a vertical position with the trap at the bottom.

Five concentric "baskets" fabricated of expanded sheet brass and held together by machined brass castings make up the filter-cartridge section. Each basket is tightly wrapped with seven layers of Canton flannel. Together, they provide more than 15 square feet of filter surface. The condenser is a compact unit of the countercurrent type and consists of more than 68 feet of ⅜-inch copper tubing arranged in the form of a spiral. Cold water goes through the piping in one direction while the air to be cooled flows in the opposite direction. The trap automatically keeps the Condensifilter free of accumulated moisture and oil. There is also a manually operated drain for the removal of scale and sludge.

Air to be cleaned and dried enters the unit at the bottom and passes through perforations in the central hollow shaft into the condensing section, where it flows around the spiral tubing. A plug in the shaft prevents the air from rising into the filter cartridge. Contact with the cooling coil causes oil and water vapors in the warmer air to condense on the surface of the tubing, dripping from there into the moisture trap. Continuing upward, the dried air goes through the filter section, where the successive layers of flannel rid it of practically all dirt, dust, scale, etc., taking out pieces as small as 0.1 micron. The filtering action also removes any tiny droplets of oil that may have become entrained in the air. Cleaned and dried, the air then flows back into the central shaft and out of the Condensifilter.

The trap used is self-purging. As the liquid level in it rises, it raises a float which causes a spring-loaded rocker arm to roll up the inclined face of a cam. At a preset point, the roller passes the apex of the cam and depresses it, lifting a snap-action valve off its seat. The pressure of the compressed air in the Condensifilter then "blows down" the unit, forcing the water and oil out into a sewer or other disposal area. As the liquid level drops, the rocker arm, actuated by the falling float, again passes the preset point on the cam, causing the valve to

shut. This opening and closing in no way affects the operation of the condenser-filter.

The rated capacity of the unit is 100 cfm. of free air at 100 psi. pressure, though it will work at operating pressures as high as 500 psi. At rated capacity, the pressure drop across the filter section is less than 5 psi. The cooling-water requirements are 2 to 2¼ gpm., and are usually obtained from a nearby tap.

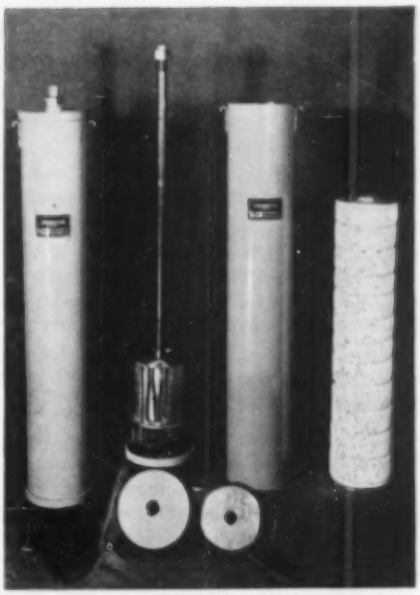
The Condensifilter supplements the primary aftercooler and is not intended to replace it. The latter condenses and removes most of the moisture in the air and suffices for most applications. However, a secondary cooler such as this one will cool the air to within 5°F. or, in some cases, to within 2° of the temperature of the cooling water and will, consequently, condense and remove still more of its inherent moisture content.

The combination unit can be taken apart for cleaning or inspection simply by unscrewing one nut from the top of the central shaft. The head and the outside case can then be lifted off and the filter cartridge, the condensing section, and the trap removed, one by one. The cartridge can be cleaned merely by dipping it into a suitable solvent and thus dissolving the dirt the flannel has accumulated. Care should be taken to dry it thoroughly following cleaning to eliminate the possibility of flammable or explosive solvent vapors getting into the air-distribution system.

An example of the use of Condensifilters can be found in the new steam plant constructed in Pittsburgh, Pa., by Rust Engineering Company for Jones & Laughlin Steel Corporation to provide low-pressure steam for the company's entire South Side works. Five new Babcock & Wilcox boilers were installed to take the place of a battery of 43 old-type units and generate steam at a pressure of 158 psi. and a temperature of 466°F. The plant provides steam at the rate of one million pounds an hour for pickling baths, descaling apparatus, and other processing equipment, as well as for seven blooming and rolling mills.

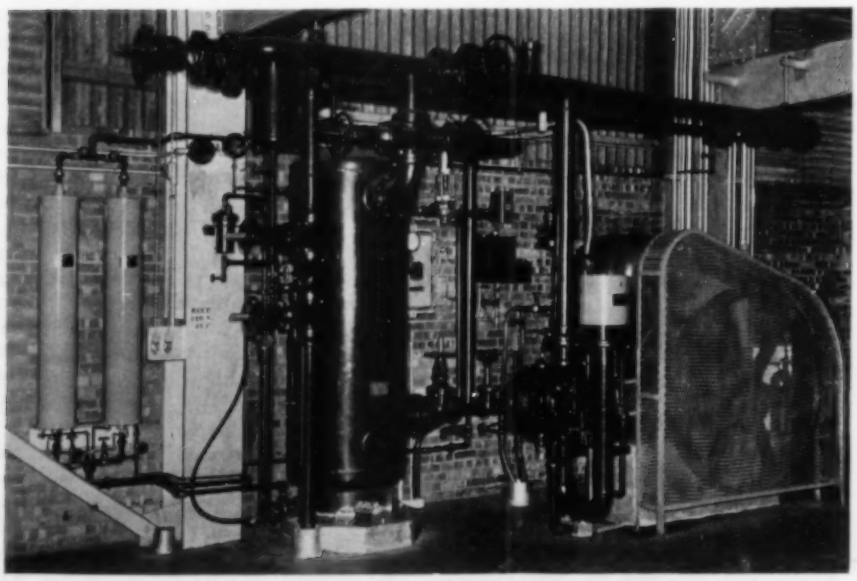
Completely automatic control of the huge boilers is obtained through the use of several pneumatic instruments located on a panel near the north wall of the boiler house. Weighing but a few pounds each, these devices regulate the operation of the boiler-feed pumps, the combustion controls, the stoker speeds, and the producer-gas system. Because so much depends upon them, it is extremely important that they function perfectly at all times. To do this, they require a dependable source of compressed air 24 hours a day seven days a week. There must be no dirt, oil, or moisture in the air to clog or foul up the control lines or the instruments themselves.

In July, 1948, the steam plant was provided with two Condensifilters to dry and clean the compressed air fed to the pneumatic control instruments. The units were hooked up in parallel to permit using either one or both, depending upon service needs. This arrangement also makes it possible to keep one in operation while the other is being cleaned. Air for the instruments is stored in a 30x84-inch tank which is connected to the plant's air-supply system. From the receiver it is delivered to the Condensifilters by ¾-inch piping. Emerging clean and dry, it is fed to the instruments by ¼-inch sweated-copper tubing, the maximum distance over which it has to travel being 500 feet.



CONDENSIFILTER ASSEMBLY

A desirable feature of the Condensifilter is the ease with which it can be taken apart for cleaning or inspection. Removal of a nut from the top of the central shaft permits the head, the outside case, and the filter section to be lifted off. The picture shows a dismantled unit alongside an assembled one.

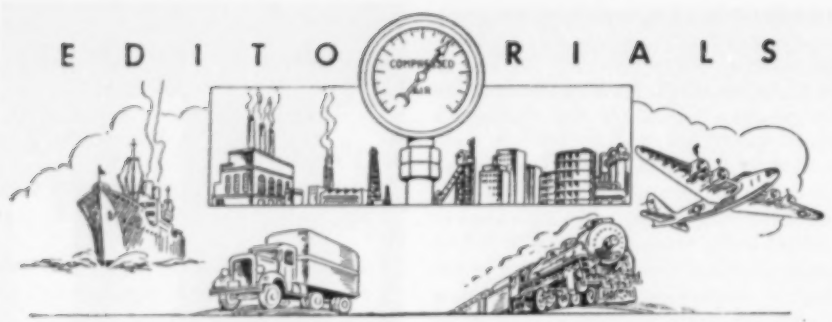


INSTALLATION VIEW

A close-up of the Condensifilter installation in Jones & Laughlin's new boiler house. The air receiver in the center is connected to the plant's air-supply lines and also to the 9x9-inch Ingersoll-Rand ES-NL compressor shown at the right. The compressor is provided with an intake filter, a pipe-line aftercooler mounted above it, and graphitic-carbon piston rings that obviate the need of cylinder lubrication and thus prevent droplets of oil from getting into the discharged air. The dual Condensifilter installation, which further filters and dries the air that goes to the pneumatic control instruments, is mounted on the wall, left of the receiver.

Normally, the plant air system keeps the pressure in the receiving tank between 65 and 100 psi. However, when it falls below 65 psi., an Ingersoll-Rand motor-driven, single-stage compressor automatically cuts in and boosts the pressure up to 100 psi. It then idles until the pressure again drops. Of the ES type, the machine has piston rings made of graphitic carbon that eliminate the use of oil for lubricating the compressor cylinder. A pipe-line aftercooler with filter is mounted above the unit and connected to the air receiver. This combination of plant air system, auxiliary compressor, and Condensifilters assures the control instruments a dependable supply of thoroughly clean and dry air.

The applications of Condensifilters are many. In addition to serving pneumatic control instruments in power, steel, chemical, and other industrial plants, they can be used in connection with temperature-recording equipment, with paint and enamel processes, and by breweries and distilleries. In short, they are applicable wherever exceptionally clean and dry compressed air is needed.



MODERN RAINMAKERS

WHEN the Indians of the arid Southwest needed rain for their crops, they went through ceremonial exercises, with musical accompaniment, in the presence of symbols representing clouds and lightning. Thus they invoked the powers of the rain gods to loose life-giving moisture. Modern palefaces, who might scoff at the efficacy of this sort of mumbo-jumbo, are themselves toying with tricks in an effort to wheedle rain from the heavens.

Today's rainmakers dress up their hocus-pocus with scientific frills. They make their appeal not to the rain gods or dummy clouds, but to the clouds themselves. Riding through the floating mists on aerial steeds, they cast out a man-made concoction—dry ice—that the Indians never dreamed of. Or, they stay on the ground and create blasts of air to propel another product of the laboratory, silver iodide, far enough upward for it to drift into the cloud formations. In either case the aim is to introduce nucleii around which cloud-borne water vapor will gather into droplets that will become heavy enough to fall.

Much has yet to be learned about this new procedure, but it appears to bring results under favorable conditions. Last July, the Army, Navy, and General Electric Company joined forces in New Mexico to bring down an estimated 320 billion gallons of rain. Other experiments have met with varying degrees of success.

Eying these performances enviously, officials of the City of New York, made suddenly water-conscious by an unusual drought, are going to try out this scientific legerdemain. In mid-February, Water Commissioner Stephen J. Carney visited Schenectady, N.Y., to talk with General Electric's rainmaking wizards, Dr. Irving Langmuir, originator of the dry-ice technique, and Dr. Bernard Vonnegut, who introduced the silver-iodide process.

Outcome of the trip is the announcement that the city will conduct meteorological investigations to ascertain whether celestial conditions over its watershed are favorable to inducing rainfall. Even if they are, some weighty matters will have to be considered before a decision is made to proceed with attempts to encourage precipitation. For instance, there is the question of who owns the clouds. Scientists agree that New Yorkers might strip the drifting billows of moisture which, if left there, would eventually fall on some other area, say New England. That could conceivably provoke a lawsuit. Apparently, before man can be given free rein to tinker with Motor Nature's rainmaking schedule, the Supreme Court may have to pass on the legality of the action.

There is also the question of what would happen if so much rain fell as to damage property. That, too, could easily transpire, the scientists say, especially if the silver-iodide technique were employed. Here, again, the city might have to face legal action running into large sums. It is because of these uncertainties that New York will investigate the rainmaking business thoroughly before engaging in it. This will involve determining not only whether rainfall can be induced but also whether it can be controlled within safe limits.

MISDIRECTED GENIUS

IT IS to be deplored, of course, that so much of the world's energy and brain power is expended towards militaristic ends. If a way could be found to prevent wars, and all the genius that is now applied to destruction were turned to construction, the pace of global progress would be greatly accelerated. As it is, we alternately build up and tear down. Inasmuch as we are learning how to destroy in a few minutes that which it has taken years to build, it is obvious that unless a halt is called the day will come when there won't be much left to fight for.

It is interesting to observe that the noted British magazine *Punch* was thinking along these lines an even hundred years ago. In 1850, the age of industrial construction was just beginning. Iron was the key metal, because steel was still too expensive for most uses. Even so, some marvelous structures had been erected. In that year Robert Stephenson had completed his famous 1841-foot Britannia Bridge across the Menai Strait between the Island of Anglesey and the mainland of Wales. It still carries railroad traffic and has as its neighbor an even more notable bridge, the suspension span erected between 1819 and 1826 by Thomas Telford to accommodate the stagecoach traffic of the period.

Following the opening of the Britannia Bridge, *Punch* remarked upon the honors that were accorded military leaders for "killing a few thousand people," and then followed with this pithy observation: "A thousand times greater man—a marvellous worker in iron, one Stephenson, drives the 2,000,000th rivet in the plate of the Britannia bridge, thereby consummating a work as great as the Pyramids . . . . Had Stephenson, from the cannon's mouth, fired away a hundredth part of the iron with which he has gripped Menai from shore to shore, his coat would have been hung with trinkets thick as a jeweller's window."

MECHANICAL MUSCLES

MODERN construction jobs move fast because machinery has largely supplanted horses and men. Exemplifying the results of this trend is a brief description in the *LeTourneau Co-Operator*, published by R. G. LeTourneau, Inc., of a highway relocation job in a mountainous section of Colorado. The new roadway will occupy a shelf excavated in the side of a steeply sloping rock face. The material removed by drilling and blasting was essentially solid chunks of granite with very little earth.

A power shovel loaded the rock into "Tournarockers"—trucks built expressly for transporting muck of this kind. Each unit consists of a 16-ton-capacity rear-dump steel body mounted on a pneumatic-tired chassis. In this instance the average load was 10½ cubic yards, and the shovel usually handled it in seven passes of the dipper. The carriers disposed of the material at distances varying from a few feet to a half mile from the shovel. On a 1240-foot run, they averaged a round trip in nine minutes over a rough, narrow, twisting road with grades up to 13 percent. "Fast cycles were possible," the account explained, "because 4-wheel air brakes let operators haul heavy loads at maximum speeds with complete safety." Average dumping time was eight seconds.

Horses and men are prominent in old pictures of railroad and highway construction work, but a horse would now be so great an oddity on such a job as to attract attention. Men are still there, but mainly to operate or control machinery, and their tasks are made relatively easy by pneumatic, hydraulic, and electrical hook-ups. Equine and human muscles couldn't do enough work to justify today's wages. Thanks to the inventiveness of the human brain, the lot of both man and beast has improved immeasurably in recent decades.

This and That

Where Life Is Stern

Ordinary conceptions of the behavior and characteristics of commonly used materials do not hold good under extremely low temperature conditions. *Canadian Weekly Bulletin*, a publication of the Canadian Government, brings out this fact in a discussion of the joint Alaskan maneuvers of Canadian and United States military forces. This training excursion, which somehow acquired the name of "Exercise Sweetbriar," was planned to develop ways and means of repelling any attack that might be made on North America through the Arctic. It also was designed to test the latest developments in clothing, equipment, and weapons under field conditions. When the thermometer reaches 40 or 50° below zero, it is pointed out, military tactics must be altered accordingly. There are no "lightning assaults" or counterattacks.

"At such temperatures," it is stated, "a man must devote almost all his energies to keeping alive, and if he hasn't learned his lessons in the art of cold-weather living, the chances are that Nature will get him before the enemy does. What happens when the temperature starts plummeting? Well, ordinary diesel fuel begins to solidify at 30 below, and storage batteries lose more than half their power at low temperatures. A man literally can freeze his lungs by gulping too much air at minus 40°. Rubber tires freeze solid and crack. Engines won't start. Drinking water freezes in a few moments. Instruments with delicate moving parts often 'freeze' because of the contraction properties of the different metals. Steel becomes brittle and snaps or shatters. Food rations freeze so solid that almost everything must be heated in the field. To keep warm a man must wear such heavy mittens and boots that he cannot easily operate instruments and knobs, nor depress the clutch of his vehicle without also applying the brake. If he touches any metal with his bare hands his skin tears away when he tries to let go. Medicines freeze and burst their bottles. Radio waves are freakish and the frozen ground lacks conducting properties for the efficient grounding of radio, telephone, and telegraph equipment."

* * *

Who Said: "Don't Rock the Boat"?

At the time the U.S.S. *Missouri* was aground in Norfolk Bay, several correspondents asked us why compressed air wasn't used to break the suction that held the big ship in the mud. Not being in the Navy's confidence, we don't know, but the natural assumption is that not enough compressor capacity was available to make the attempt. Another possible method of procedure that has sometimes worked under similar conditions in the past was probably ruled out by the size of the vessel. This consists of walking the entire ship's crew back and forth across the deck to set up a rocking motion. According to Homer E. Wood, of Tiger, Ariz., this simple maneuver released the U.S.S. *Kentucky* from some of that same Norfolk Harbor mud in 1907 while he was serving on that craft. All ammunition was taken off before walking began. The ship was freed in that way after all the tugs in the port had failed to budge her.

* * *

Weighting the Tires of Tractors

To increase the tractive effort of farm tractors, their pneumatic tires are often partially filled with water. According to the B.F. Goodrich *Farmer's Handbook*, 1950 edition, this practice is endorsed by all the tire manufacturers, provided a sufficient volume of compressed air is allowed to remain in the tires to serve as a cushion to absorb shocks. If a tire is entirely filled with a noncompressible fluid, it will be bruised when striking rocks, bumps, or ruts. Goodrich recommends three-fourths water and one-fourth air, by volume. Tests have indicated that a tire's bruise resistance is only 4½ percent less under those conditions than when fully charged with air, whereas it drops 23 percent when it contains only water. It was formerly a day's work for a farmer to put water into a tractor's tires, but injection or withdrawal can now be effected in a few minutes with a portable pump designed for that service. In areas where winter temperatures are low it is necessary to add some kind of anti-freeze to the water. Flake calcium carbide is commonly used for the purpose.

* * *

Diamond Mine Is Reopened

Following seventeen years of inactivity, the famous New Jagersfontein diamond mine in South Africa was reopened last December under the auspices of the De Beers organization that controls world diamond production and distribution. It has been reëquipped with modern machinery and will employ 350 Europeans and about 2000 Natives. Although notable for the size and purity of its stones, the mine had to close down in 1932 because of the poor market for the gems.

There is a bit of irony in the story of the discovery that led to the development of the Jagersfontein. It is in a small valley a few miles from the village of Fauersmith in Orange Free State. In the 1860's hordes of fortune seekers passed through the section on their way from coastal ports to the diamond fields

"Well Warden, you know what they say about an old dog and new tricks."

in the Vaal River valley. None of them ever gave it a thought as a possible source of wealth. At the time a man named Cornelius Visser was farming a considerable part of the Jagersfontein valley, and when he died his widow continued to carry on with the aid of an overseer named De Klerk.

A small stream flowed through the area, and De Klerk noticed garnets and other semiprecious stones in its sandy bed. Learning that these minerals were indicative of the presence of diamonds, he began prospecting and, in August 1870, found a 50-carat stone 6 feet below the surface. The widow parceled out the land to neighbors, each of whom paid her £2 a month for the privilege of working a plot 20 feet square. A company was later organized and gradually acquired most of the claims. For 40 years mining was conducted in an open pit, which became 600 feet deep. All the rock broken on the various benches was brought to the surface by compressed-air hoists that operated wheeled cars running on wire cables extending to the various working points. During the year 1909 a total of 1,660,196 loads of "blue" ground and rock, each weighing around 1600 pounds, was hoisted in this manner.

In 1910 a shaft was sunk to a depth of 1000 feet in ground outside the diamond-bearing "pipe," and by 1913 open-pit mining was abandoned. Thereafter, all material excavated was brought to the 900 level and there loaded for hoisting. An average of 12,800 tons was raised daily, making the shaft the greatest vertical transportation system in existence. Operations were suspended for four years during World War I. They were resumed in 1918 and carried on until 1932. In view of the current revived demand for diamonds, expectations are that work will continue until the deposit is exhausted.

Most Jagersfontein diamonds are pure white, but occasionally a sapphire-blue stone is found. The largest diamond yet discovered was the "Excelsior," which weighed 971¾ carats. A native boy came upon it on June 30, 1893, and was rewarded with £500 cash and a horse and bridle. Experts valued the stone at anywhere from £50,000 to £1,000,000. From it were cut 21 large brilliants totaling slightly more than 364 carats in weight.

★ ★ ★

Fly Ash for Light Concrete

Recent research has disclosed that lightweight aggregates can be used to advantage in making concrete for many applications, and a variety of materials is being utilized for the purpose. As a result of these developments the Commonwealth Edison Company, of Chicago, Ill., has received a windfall that may presage similar benefits to other large operators of coal-fired boiler plants. Commonwealth's electric-generating stations normally produce around 150,000 tons of fly ash annually, and all but a small fraction of it has previously been wasted. Now it is announced that 50,000 tons will be supplied during each of the next three years for inclusion in the concrete entering into Hungry Horse Dam on the Flathead River in western Montana. Engineers of the U.S. Bureau of Reclamation, who approved its use, estimate that it will save around a million dollars in concrete and considerably reduce the generation of heat during the setting process. The fly ash will be sold for $1 a ton, but freight charges will bring its delivered cost up to $12 a ton.

★ ★ ★

U.S. Steel Reveals Ore Find

The United States Steel Corporation lately disclosed the discovery in Venezuela in 1948 of a huge deposit of iron ore that is richer than the now dwindling Lake Superior ores. After aerial photographs had indicated mineralization, magnetometer surveys and diamond drilling verified the existence of a mountain of ore that may contain as much as a billion tons. Called Cerro Bolivar, it is located near a tributary of the Orinoco River and about 50 miles from important deposits now being developed by M. A. Hanna Company and Bethlehem Steel Company. U.S. Steel is already opening up the ore body and plans to build several large ships to transport ore to this country. Much of the iron will probably be used in a new steel mill to be situated on the Delaware River at a point 30 miles upstream from Philadelphia. Purchase of a 3800-acre site there has been announced, but erection of the mill has not yet been authorized. Discovery of the Cerro Bolivar deposit terminated a search carried on by U. S. Steel geologists since the end of World War II in Africa, Canada, Mexico, Cuba, Nicaragua, Venezuela and elsewhere.

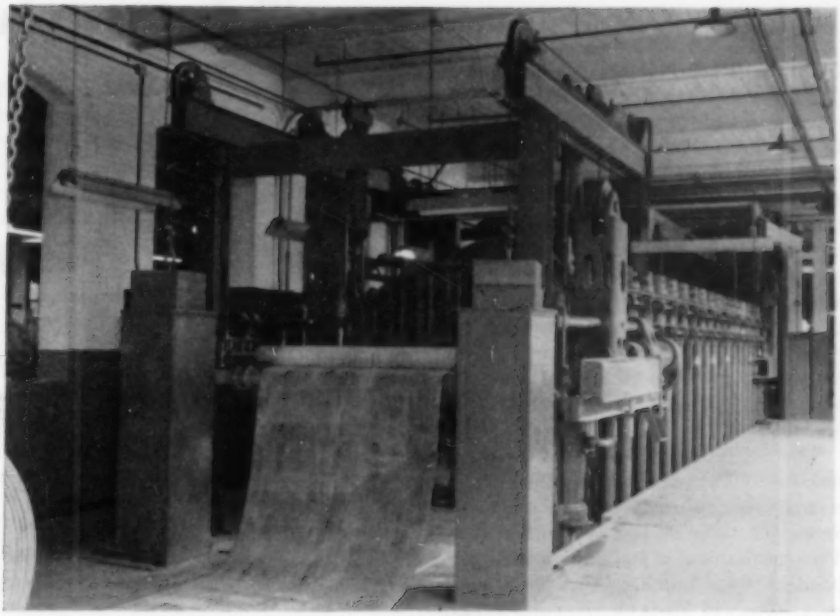
"Turn on the air, Chumley. It's cocktail time."

★ ★ ★

Large Water Tunnel

The Clunie Tunnel, largest water-carrying bore so far driven in the British Isles, was completed late in 1949 in central Scotland. It is a part of the Tummel-Ganz Project, which is one of several hydroelectric schemes now being carried out by the North of Scotland Hydro-Electric Board. The tunnel is 23 feet in diameter and 9158 feet long. It was holed through last August and subsequently lined with concrete at a rate of as much as 400 linear feet per week. The bore and large connecting pipes will deliver water from the River Tummel to three 19,000-kw. generating units in the Clunie power station.

Giant Precision Press Vulcanizes Conveyor Belting



PRESS IN SERVICE

To house this huge machine, Manhattan built a 150-foot-long addition to its factory. By means of a specially developed control system, the temperature throughout the entire 40-foot-platen area is held within 2 degrees of uniform.

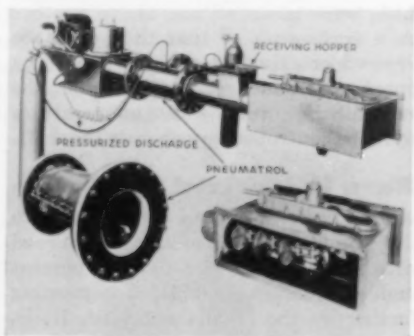
TO MEET the increasing demands for conveyor belting, the Manhattan Rubber Division of Raybestos-Manhattan, Inc., has put into operation at its Passaic, N.J., factory the largest hydraulic belt-vulcanizing press now in service. Custom built by the Baldwin Locomotive Works, it is 40 feet long, 10 feet wide, and 13 feet high, and weighs approximately 310 tons. It has a platen that permits applying uniform pressure and heat to cure a belt area of 40 feet by 74 inches.

This is the third time Manhattan has installed the "then largest" press for this service. In 1898, when the company was only five years old, it put in a machine that was 25 feet long and 50 inches wide. Although most belting was then being used for transmitting power, and that means of conveying was still in an experimental stage, Manhattan officials envisioned the trend towards the new method of moving bulk materials. Again, in 1913, another "giant" press was installed. It was 36 feet long, weighed 275 tons, and was used to cure 13,500 feet of 36-inch-wide belting destined for a South American copper mine.

In those early days, conveying of heavy bulk materials was largely confined to the mining industry. The first application in the construction field is said to have been made in 1921 at a dam near Stamford, Conn., and involved 6500 feet of belting. In 1924 five miles of Manhattan belting was used in building the Wanaque Dam in northern New Jersey and attracted visiting engineers from this country and abroad.

Manhattan engineers worked closely with Thomas A. Edison in developing early conveyor belts. From those efforts came the first one with a reinforced cover suitable for handling heavy, coarse materials. Nowadays, conveyor belts are individually engineered in accordance with specific job requirements. To add strength where it is needed to take care of stresses and loads, synthetic fibers and sometimes steel are incorporated instead of cotton. Fabricating belts for particular services is akin to constructing buildings or bridges, and the designer must provide the proper balance between rubber and strength members to meet the conditions imposed.

Constant Feed Through Pressure Zones in Conveyors



COMPOSITE VIEW

The Pneumatrol is pictured separately and interposed in standard steel pipe connecting the receiving hopper and the pressurized discharge section of a conveyor. The two air cylinders standing at the far end are only for purposes of illustration. The unit at the lower right is the take-up box with the cover plate removed to show the solid-rubber chain flights that fit snugly against the flexible sleeve in the pressure feeder to prevent the escape of air.

HOW to convey flowable materials into or out of pressure or vacuum zones and how to make the flow continuous are two problems which have long faced manufacturers of processed stock. Now Hapman Conveyors, Inc., has introduced a pressure-feeder unit that is said to accomplish these ends without the use of air locks and auxiliary gates. Pneumatic controls called "Pneumatrols," which allow a differential in pressure between the receiving and discharge points, figuratively divide the conveyor into two parts—an atmospheric section and a pressure or vacuum section, depending upon service requirements.

Material is fed continuously into a hopper at atmospheric pressure, carried through the Pneumatrol into the pressure section of the conveyor, and discharged into a container under the same pressure. Since the conveyor is a closed circuit, a Pneumatrol must be installed in the return line to maintain the pressure in the container. By a change in the conveyor circuit, the procedure can be reversed; that is, material can be delivered from a pressure zone to one at atmospheric pressure.

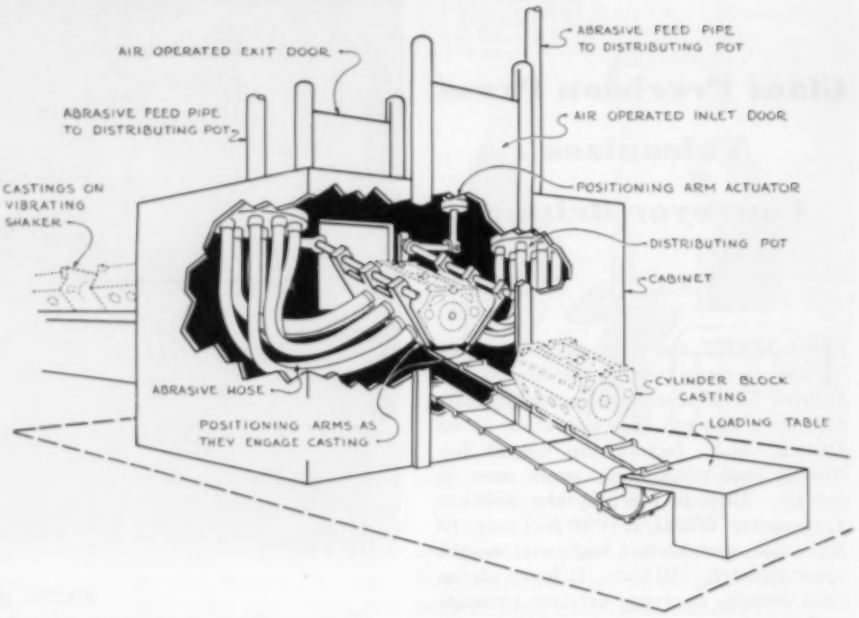
The inner sleeve of the unit is a flexible member that is usually fabricated of rubber and mounted in a steel casing so as to leave an airtight annular space between them. For feed at a temperature above the range of ordinary rubber, a silicone rubber called "silastic," capable of withstanding up to 450°F., can be used. Water-cooled systems may be introduced above that point. Air or water pressure admitted into the annular space will cause the inner sleeve to contract, insuring a snug fit between the sleeve and the round chain flights as they pass through the Pneumatrol. The flights are of solid-rubber construction so as to prevent the escape of air, as well as the material being carried, thus permitting continuous movement through the conveyor system.

Automatic Machine for Blasting Engine Blocks

BY APPLYING special equipment for automatically sandblasting the interior openings of automobile engine blocks, Ford Motor Company has virtually eliminated the possibility of engine trouble in service caused by obstructions in the cooling-water passages. The new machine supplements equipment previously used for cleaning the blocks after casting and gives more surety that burnt core molding sand and scale will be removed from internal spaces. Overheating or cracking because of a restricted flow of cooling water will thus be greatly reduced.

The machine is housed in a closed cabinet through which engine blocks move on a conveyor, halting for a predetermined length of time at the cleaning station. Two mechanical arms, one on each side, position each block in turn with accuracy. When in place, nozzles on the ends of sixteen hoses are precisely registered with openings in both sides of the block. Compressed air under 85 psi. pressure is then turned on and the inner walls are blasted with steel or iron shot and grit. While a block is being cleaned, the air-operated entrance and exit doors of the cabinet are closed. All functions are automatic, and the duration of the blasting period can be controlled as desired by adjusting a timer.

This treatment is reported to clean the inside surfaces thoroughly because the abrasive is carried through narrow openings and penetrates all recesses. The loosened material is readily removed on a vibrating shaker to which the blocks are delivered from the cabinet. It is planned to equip each motor-block cleaning system in the Ford foundry with one of the newly developed machines.



HOW IT WORKS

This schematic sketch shows an engine block, gripped securely by positioning arms while its inside surfaces are blasted clean with shot and grit propelled through nozzles extending into openings on each side. Abrasive is piped from overhead into pots that distribute it to each of sixteen hoses carrying compressed air at 85 psi. pressure. Loosened sand and scale are removed on a traveling vibrating shaker.

Electric Heaters Combat Cold in Shaft-Sinking

DURING the sinking of a shaft at the Calverton Colliery, Nottingham, England, it was necessary to freeze the ground to exclude water. At a depth of 100 feet below the surface the air temperature was 22°F. and that of the wall 18°. The water-laden sandstone being penetrated was frozen hard. The low temperatures prevented the concrete lining, poured in contact with the walls, from setting. At times they also caused air-operated rock drills to freeze, and it was frequently necessary to bring the tools to the surface for thawing.

HEATER ARRANGEMENT

The three units are shown suspended near the shaft bottom but out of the way of the workmen. They were moved as desired to heat local areas.

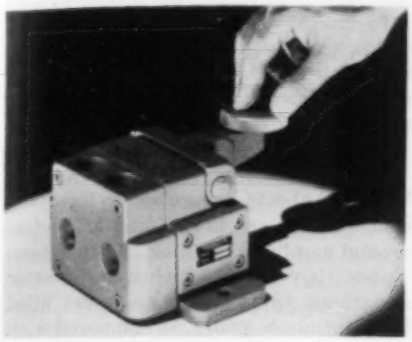
To overcome these difficulties, Arthur Wadsworth, engineer for the National Coal Board, devised a method of heating the working area. Three 15-kw. industrial-type unit electric heaters manufactured by General Electric Company, Ltd., were mounted one above another on a framework so that they could be lowered or raised at will like a sinking pump. By maneuvering the heaters, the atmospheric and wall temperatures could be controlled anywhere in the shaft.

Locomotive Equipped to Burn Pulverized Coal

PULVERIZED coal for fueling gas-turbine locomotives has been under test for months and, according to a recent progress report by Bituminous Coal Research, Inc., has successfully demonstrated its practicability in this field of service. The findings are the outcome of laboratory work and a stationary experimental run with a full-size gas turbine, all conducted under the auspices of the organization's Locomotive Development Committee working in coöperation with nine railroads and five coal producers.

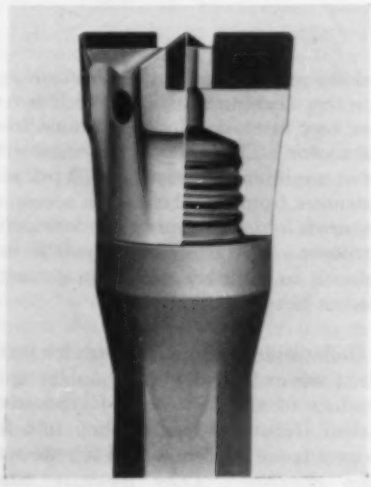
The test was made at the plant of the American Locomotive Company by means of a turbine provided by the U.S. Bureau of Mines and proved that pulverized coal can be fed continuously to the combustion chamber and burned with an efficiency exceeding 90 percent under a pressure of 60 psi. Commenting further on the results obtained, R. B. White, president of the Baltimore & Ohio and chairman of the committee, said that it would be premature to assume that all technical problems have been solved but that the group is well pleased with the showing, as well as with the performance of the ash-removal equipment. Allis-Chalmers Manufacturing Company has already completed a gas turbine for a locomotive, the first to be powered by such a unit, and Elliott Company is building another one.

Industrial Notes



Push-button control of a new, fast-cycling type of 4-way valve for the operation of single- or double-acting air cylinders and other pneumatic equipment is announced by Hannifin Corporation. Air at 25 to 150 psi. line pressure is the force that moves the piston-actuated main valve through the medium of a pilot control that is connected to the lever of a ⅜-inch knob and responds to light pressure by finger, palm, or knee on the knob. A compression spring raises the latter when pressure is released. Ruggedly constructed for heavy-duty industrial service, the device features a reciprocating, packless, self-lapping main-valve disk and is available in ½- and ¾-inch sizes.

A new drill-rod attachment that is said to be as resistant to wear as its Carset (tungsten-carbide) Jackbits has been developed by Ingersoll-Rand Company primarily for use with these bits. It is of the shoulder type and has 38° reverse buttress threads. The effect of the 38° matching surfaces on both attachment and bit is to cushion and absorb the destructive reciprocating and rotational forces that tend to ruin bit threads and to break the threaded extensions on drill steel. As a result of the improvement in attachment design—in the form, pitch, and size of the threads—it has been possible to increase the thickness of the bit skirt and, consequently, the strength of the bit. According to the company, the attachment withstands shock and impact and will give the same long service as the bit itself. Four sizes are available for bits from 1 ⅜- to 3-inch gauge.

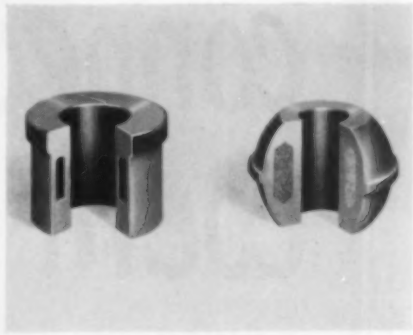


As a supplement to warning signs in areas where energized equipment is in service, or where other hazardous electrical conditions exist, the Brenton Equipment Company recommends the use of its barricade tape. It is made of a woven plastic in a variety of color combinations and is ⅝-inch wide.

Tests are being conducted at the Army's Engineer Research and Development Laboratory at Fort Belvoir, Va., with what is described as a tough, translucent, noncorrosive pipe made of sand and synthetic resin. A section 20 feet long weighs one-fifth as much as a piece of steel pipe of equal length. It offers especial advantages, it seems, for field petroleum distribution.

Made primarily to protect rails in tunnels against the harmful effects of moisture and acid fumes, R-M Coating can be applied to tracks anywhere as well as to equipment exposed to similar conditions. Solution can be brushed or sprayed on, or can be thinned for dipping. It is said to retain its flexibility under severe temperature variations, to be highly resistant to abrasion, and to adhere well. R-M is available as a primer or as a finish coat and is produced by the Rinshed-Mason Company.

A new type of oil-impregnated sintered-metal bearing, known as the Haller Oil Well Bearing, has been introduced by the Michigan Powdered Metal Products Co., Inc. Its distinguishing feature is a cavity of uniform size in the center of the bearing wall that fills with oil or grease as the latter is forced into the pores of the metal. Because of its large oil content it is said to have a number of advantages over conventional types, namely: can take heavier loads; virtually eliminates "freezing"; does not require the customary reservoir; prevents oil from dripping; can be hardened and ground; and can be impregnated with oil or grease for different service conditions. The bearing comes in three models: pocket type, with



an open cavity for heavy loads; sponge type, with the pocket filled with sponge iron to provide capillary action for oil where heat is a factor; and thin-walled type, with a group of small holes in place of the pocket so that the wall structure is not weakened. Bearings have a wide range of application and are especially recommended by the manufacturer for use with motors and shafts of large diam-

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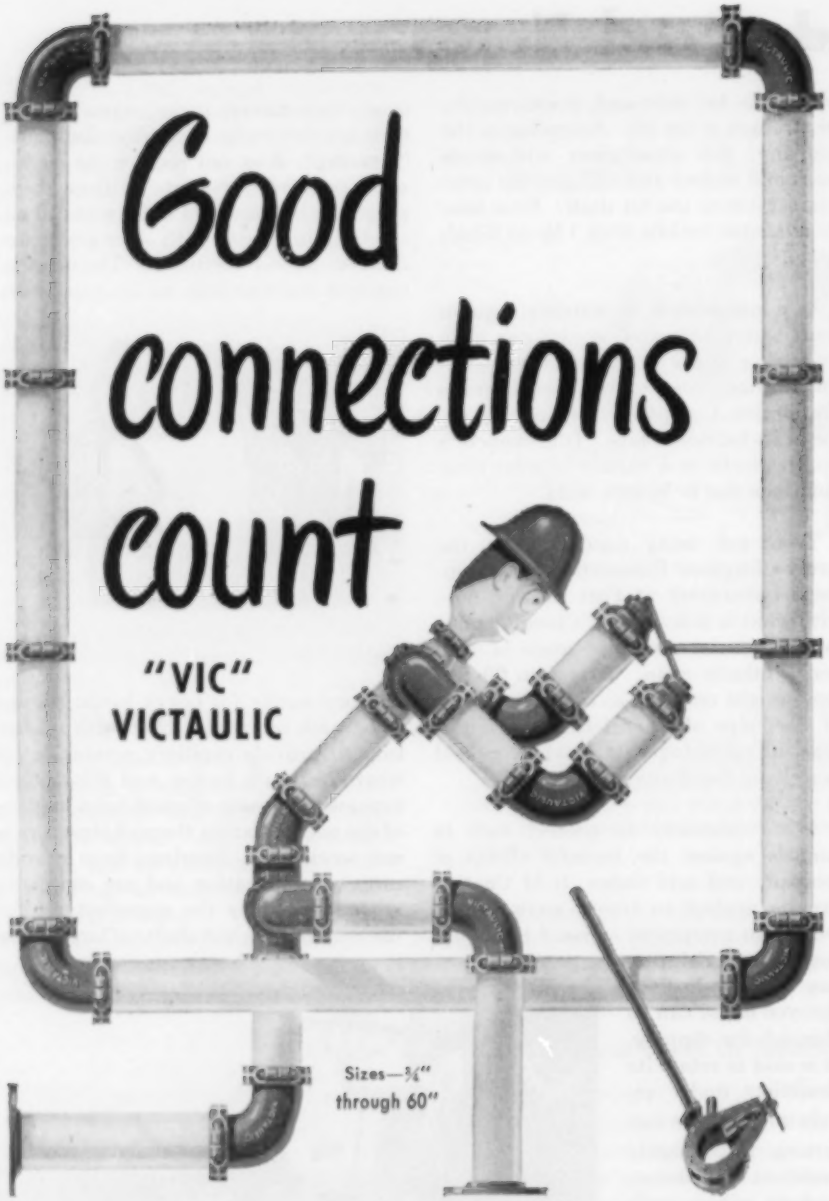

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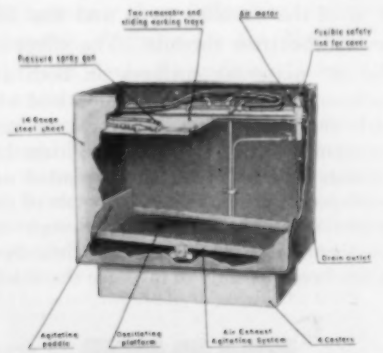
eter and, because of their nonfreezing characteristics, as guide-pin bushings.

To determine the weathering effect on building stones, the National Bureau of Standards has built an experimental wall faced with more than 2000 specimens from 47 states and 16 countries.

Tubes of heavy paper were used by Wigton-Abbott Corporation as forms for concrete columns in building an underground gasoline tank farm. Called Sono Tubes, they were 22 inches in diameter and about 13 feet high and were filled in a continuous pour. As compared with metal forms, they are easier to handle and install in close quarters.

One pound of Melt, a chemical in pellet form made by Baker-Raulauge Company, is said to be equal to 12 pounds of salt in ridding sidewalks, steps, driveways, loading docks, etc., of snow and ice. Also suitable for thawing frozen gutters, pipes, and railway switches. Compound leaves no messy residue, says the manufacturer, and if applied at the beginning of a storm will melt snow or sleet falling on it.

"Laundro-Mat" treatment of metal parts in shop and factory is now possible through a cold parts-cleaning machine made by the Magnus Chemical Company. Called Krazy-Dip, the unit has a maximum load capacity of 250 pounds per batch and is equipped with an air motor that rocks a platform on which the parts are placed. At the same time,



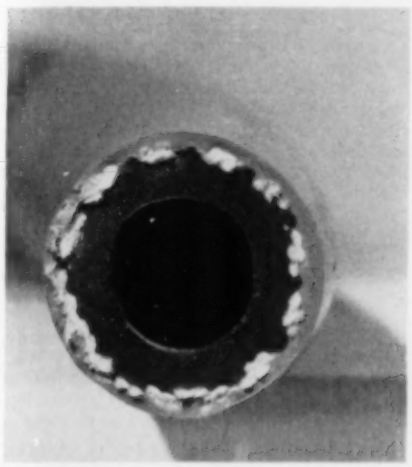
paddles at the ends of the platform agitate the cleaning solution, which is further kept in motion by the exhaust from the motor. The latter is operated with air at a minimum pressure of 50 psi. and consumes from 1 to 2 cfm. An accessory feature is a pressure spray gun for rinsing purposes. The company says the machine is to industry what the domestic washer is to the housewife.

Collapsible steel pallet boxes for intra-plant use or long-distance haulage are a product of the Fab-Weld Corporation. Called Return-O-Tainer, they fold flat to save space in storage and to reduce return charges. They measure 40x48

inches and are 24 inches deep with their hinged sides locked—the correct size for loading crosswise in boxcars or lengthwise in trucks. Standard type is of corrugated-metal construction, but units with open-mesh sides and ends are available.

Exploratory drilling done so far in Quebec-Labrador indicates the presence of 355 million tons of iron ore in that northeast section of Canada, according to a recent report on the operations. The region promises to become one of the world's largest producers of high-grade iron ore. The work now in progress there was described in our February, 1949, issue.

Newly developed by The B. F. Goodrich Company is a long-length air hose of braided construction designed specifically for use with paint-spray equipment. It is light and flexible, qualities that are said to be desirable in that they reduce drag on the operator. Made of



tough stock with a red cover and a smooth mold finish to lessen the accumulation of paint and dirt, the special hose is suitable for working pressures up to 150 psi. It is available in four sizes.

For induction soldering, brazing, and heat-treating on a production basis, Sherman Industrial Electronics Company is manufacturing a turntable with interchangeable heads to provide from 6 to 24 stations, depending upon the size of the work. Each station has a spring-loaded unit that slides the part forward and locks it in place. Speed of the turntable is adjustable from 1 to 9 rpm.

Extensive deposits of magnetite have been discovered in the Dominican Republic, according to a statement issued recently by the Dominican Information Center in New York City. The ores are said to average 68 percent metallic iron and to be superior to those mined in Sweden. The area already blocked out, says the report, can provide a minimum of one million tons annually for many years.

FACTS ON

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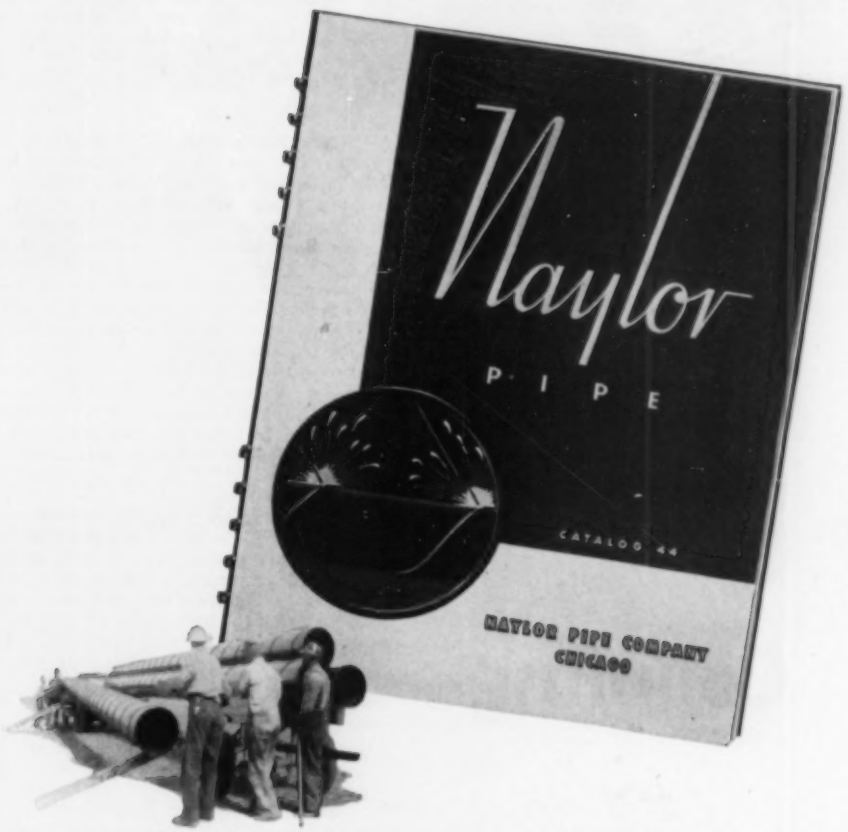

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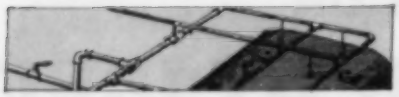

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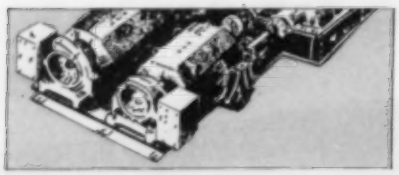

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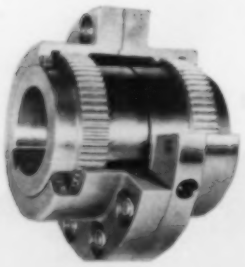

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New Books and Industrial Literature

Engineering Mechanics, by Archie Higdon and William B. Stiles, is the title of a textbook for students of engineering. It places emphasis on a thorough understanding of the principles employed in solving problems rather than on mere "answer-getting" by a process of substitution in numerous formulas. The book makes maximum use of free-body diagrams by which students can visualize each and every step involved in analyzing and solving a problem. It can be obtained from the publisher, Prentice-Hall, Inc., 70 Fifth Avenue, New York 11, N. Y. Price, $6.65.

The seventh edition of *Principles and Practice of Flow Meter Engineering* has been published by The Foxboro Company, Foxboro, Mass. Written by L. K. Spink, a member of the company, the 416-page book is a complete, authoritative treatise on flow-meter engineering. It contains all the information necessary to calculate orifices, flow nozzles, Venturi tubes, Pitot tubes, etc., for liquids, steam or other vapors, and gas. Among the new features of this edition are: measurements of fluid flow in metric units; table of corrections for barometric pressures; table of pressure multipliers up to 5000 psig.; and equations and curves for calculating throttling orifices to be used at critical pressure drops. Price, $7.00.

Remington Rand, Inc., 315 Fourth Avenue, New York 10, N. Y., has prepared for free distribution a 22-page booklet giving data on the company's line of aluminum posture chairs for office use. Adjustable five different ways to conform to varying body proportions, they are said to minimize fatigue. Several different models are illustrated and described.

Young Radiator Company, Racine, Wis., will send to interested persons a copy of Catalogue 1149 describing its new line of removable-tube-bundle heat exchangers of the shell and tube type. Both single and 2-pass models are available in a wide range of capacities. They are designed especially for the cooling of engines, cutting oil in machining operations, etc.

American Cyanamid Company has issued a revised edition of its booklet *Products and Services of American Cyanamid Company for Industry and Agriculture*. The illustrated publication of 64 pages describes the products and services which the company offers to industry, agriculture, and mining. A copy can be obtained by writing to the company at 30 Rockefeller Plaza, New York 20, N. Y.

Two new catalogues describing general-purpose hoists driven by gasoline engines or electric motors can be had by writing to the American Hoist & Derrick Company, 63 South Robert Street, St. Paul 1, Minn. No. 100-H-40 covers units of 5 to 40 hp. ranging in capacity from 2500 to 4000 pounds single-line pull; and No. 100-H-55 deals with 50 to 100-hp. hoists with single-line pulls of 5500 to 10,000 pounds.

New designs and improvements in Cycoil air and gas cleaners of the oil-bath type are described in a bulletin obtainable from American Air Filter Company, Inc., Louisville 8, Ky. The former, which come in nine sizes, are combination air cleaners and silencers for use with compressors, gas engines, etc., in powerhouses, industrial plants, and refineries. The latter, for cleaning blast-furnace gas, stack gases, etc., are available in diameters ranging from 12 to 48 inches and for almost any working pressure. Selection charts, dimension tables, and detailed engineering data are also contained in the bulletin.

A bulletin can be obtained from Air Placement Equipment Company, 2525 Southwest Boulevard, Kansas City 8, Mo., describing its Bondact equipment which is designed for the fast and economical placing of concrete, refractories, insulating concrete, acoustical plasters, and similar materials. It is provided with a pressure chamber from which the ingredients in dry form are forced through a hose to a nozzle where they are mixed with an atomized spray of water and blown onto the work.

The third revised edition of *A Handbook on Synthetic Rubber Packings* has been published by E. F. Houghton & Company. Compiled by the engineering staff of the company, the 110-page book is intended to be of help to design engineers, maintenance men, and others dealing with the selection and use of rubber packings. A copy will be sent free of charge to anyone writing on a company letterhead to 303 West Lehigh Avenue, Philadelphia 33, Pa.

A 61-page report on a new paint remover is obtainable from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. Developed by the Air Force for removing aircraft enamels that resist ordinary methods, the material is applied by spraying, followed by washing with high-pressure water. Check or money order for $1.75, made payable to the Treasurer of the United States and sent to the foregoing address, will cover cost of the report, PB 97658 entitled *Development and Evaluation of Paint Remover*.

Allis-Chalmers Manufacturing Company, South Seventieth Street, Milwaukee 1, Wis., will send to interested persons a copy of Bulletin 61B6382A which describes dry-type transformers suitable for duty right at the load center. Built in sizes of 1½ kva. and larger in single-phase construction and 9 kva. and larger in 3-phase types, they are designed for hard service and ease of handling. Units have all-welded steel cases, sturdy lifting hooks, strong side frames, generous-sized air ducts, and clamp-type connectors.

The Anti-Friction Bearing Distributors' Association has published a 20-page booklet entitled *Installation, Maintenance, Removal of Anti-Friction Bearings*. It was compiled and printed as a service to plant supervisors, maintenance men, and others responsible for the upkeep of equipment with anti-friction bearings. It gives information on the different types of bearings; their installation, lubrication, removal, and cleaning; and tips on how to handle and prepare them for storage. A copy can be had free of charge from the Association at 1900 Euclid Building, Cleveland 15, Ohio.

Flexible plastic tubing having many industrial applications is dealt with in a 24-page bulletin now being distributed by the U. S. Stoneware Company, P.O. Box 350, Akron 9, Ohio. It is made of one of a group of modified vinyl thermoplastic materials that become tough, colorless, and hornylike upon hardening. Possessing many chemical-resistant properties, the materials are also available in rigid, semirigid, or flexible sheets; in solid cord, tape, or extrusions of virtually any cross section; in molded form; and in solution for use as a paint or impregnant.

New air hose for "tight-corner" jobs weighs 50% less, handles easier

NEW Highflex air hose developed by B.F.Goodrich is half the weight of ordinary air hose, many times more flexible and easy to use in tight corners. And with this weight saving, Highflex hose actually gives you *higher* burst strength than heavy old-type hose of the same i. d. For the hard-to-get-at job where lightness and flexibility are so important, Highflex gives you —

50% weight saving — Here is the first really lightweight air hose. 100 ft. of this hose in ¼" size saves you 11.2 lbs. And all sizes of Highflex give you substantially similar savings.

More flexibility — Highflex is easier to work with. It lets workers operate efficiently in close quarters, in awkward positions, in hard-to-get-at locations. Because of its easy-handling qualities workers tire less easily, can increase production.

High working pressure — Highflex is recommended for working pressures up to 250 lbs. Double braided, single ply construction. Low expansion under pressure, minimum contraction of length.

Highflex is oilproof—Because Highflex air hose is completely oilproof, you can lubricate tools without fear of oil causing hose to swell or flake, to cut air volume or jam the tool. The cover is oilproof, too — dragging the hose through oil or grease won't hurt it.

Other Highflex advantages — Red cover of high visibility. Cover that resists checking, snagging, and abrasion. Lighter weight and bulk make it easier to store. Ask your local BFG distributor to show you this new and better air hose. *The B.F.Goodrich Company, Industrial and General Products Division, Akron, Ohio.*

Air Hose BY

B.F.Goodrich

PRECISION ENGINEERED
for Top Efficiency

Precision in Cook Packings means more than holding to close dimensional tolerances. It means careful control of every detail of construction—from the initial engineering design, through the refinement of the materials used, to the final assembly of the component parts.

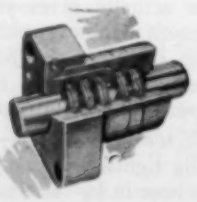
This "precisioneering" pays off in end results. It means that Cook Packings are built from start to finish to provide your compressors with maximum sealing at minimum costs. "Precisioneering" is the reason why Cook Packings give longer service, why they cut overhauls, repairs and costly delays.

Proof of their performance is found in the fact that Cook Packings are the standard for refinery, repressuring, recycling and natural gas pumping compressors.

Remember there's a Cook Packing for every temperature and pressure requirement met in service today. If you'd like the full story, call our nearest branch office. The advice and recommendations of our field engineers are yours without obligation.

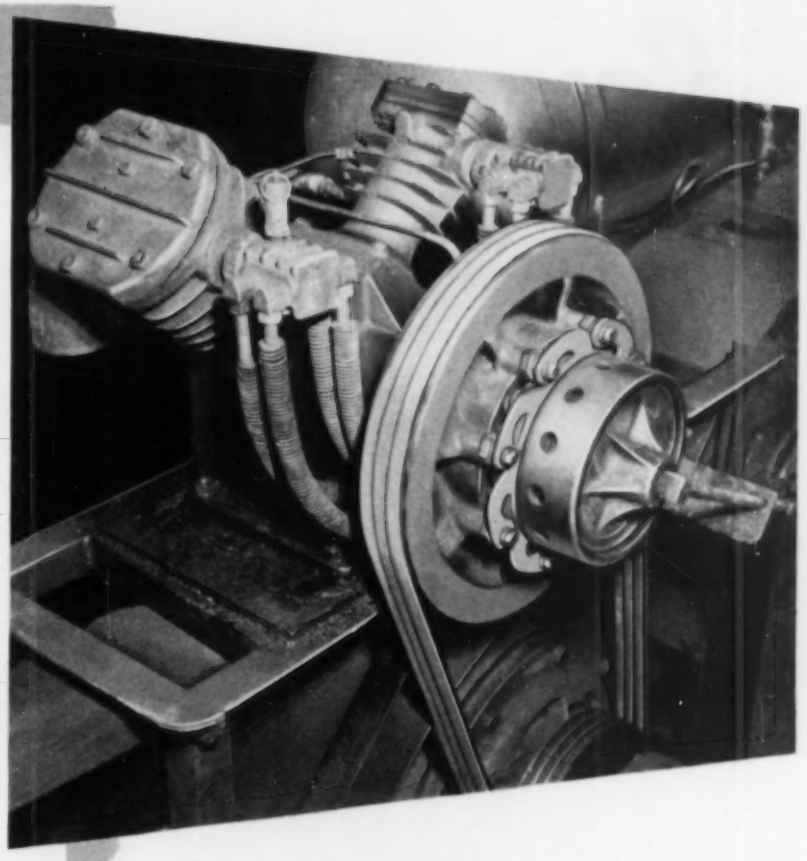
C. Lee Cook Mfg. Co., Inc., Louisville, Ky. Branch offices in Baltimore, Boston, Chicago, Cleveland, Houston, Los Angeles, Mobile, New Orleans, New York, San Francisco and Tulsa.

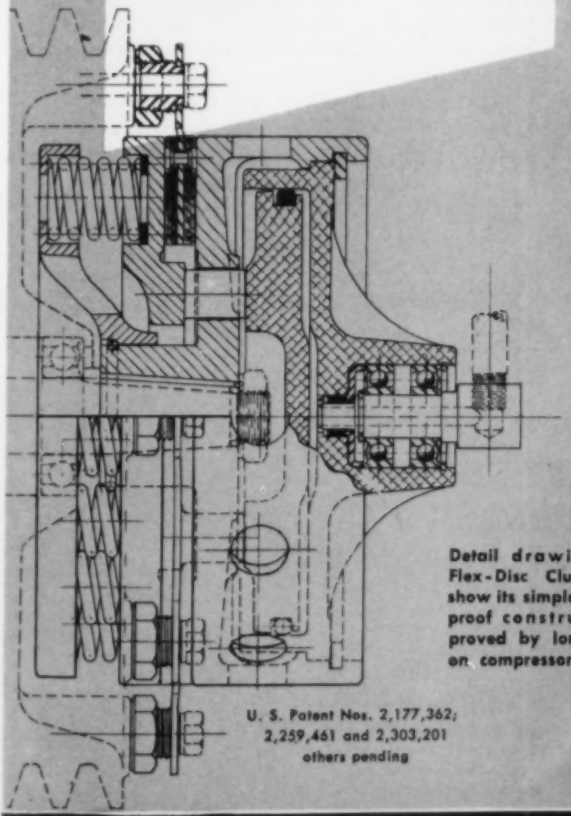
COOK
ROD PACKINGS



. . . SEALING PRESSURES SINCE 1888 . . .

air released clutch saves compressor wear





Detail drawing of Flex-Disc Clutch to show its simple, foolproof construction proved by long use on compressors.

U. S. Patent Nos. 2,177,362; 2,259,461 and 2,303,201 others pending

COMPRESSORS equipped with *Flex-Disc Air Released Clutches* run only when air is needed. *Unloaders are dispensed with.* That saves a lot of wear and maintenance costs on the compressor's cylinders, pistons, and bearings.

When maximum air pressure is reached a regulator valve admits air to cylinder to release the clutch and stop the compressor. Flywheel and drive plate keep on running without drag or heating. A drop in air pressure causes the regulator valve to release air from the clutch cylinder and reestablish drive to the compressor.

Pictured above is a compressor with *Flex-Disc Air Released Clutch* operating on an oil drilling rig in Texas. Like the *Flex-Disc Clutches* used for many years past on I-R Portable Compressors, this clutch is spring-loaded to engage. It is air-released.

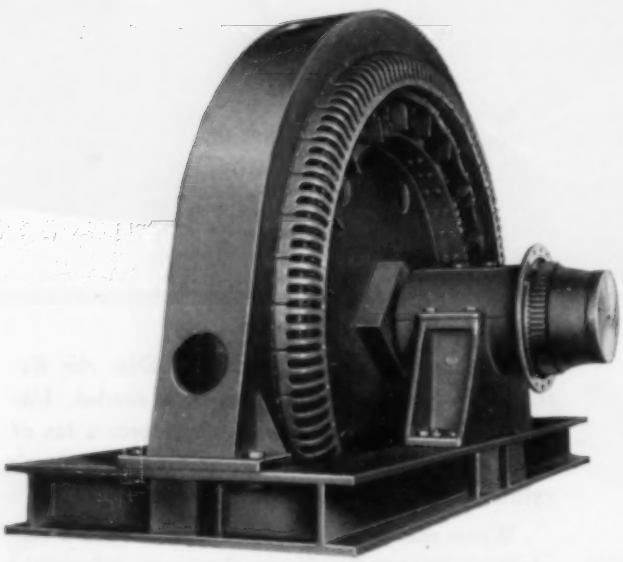
The *Flex-Disc Air Released Clutch* is available in a range of sizes and for many varying applications outside the compressor field.

INDUSTRIAL CLUTCH CORPORATION

Waukesha Wisconsin

Save on original costs

use G-E synchronous

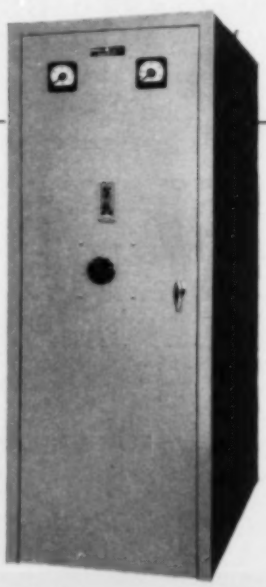


You'll save money in many applications when you specify General Electric synchronous motors. The chart shows (ratings above the black line) the applications where synchronous motors (including control and exciter) have a lower first cost than any other kind of motor. And even in cases where there is no original saving (between red and black lines) you can save on over-all cost by specifying synchronous motors to increase operating efficiency and improve power factor.

When you specify G-E synchronous motors, you get application engineering by experts in the electrical problems of *your* industry. You get the motor that gives you greatest return on your investment.

For your next large, constant-speed motor, ask your General Electric sales representative to tell you how you can take full advantage of the money-saving features of G-E synchronous motors. Or write for bulletins on your letterhead to *Section 770-17, Apparatus Dept., General Electric Co., Schenectady 5, N.Y.*

Low speed . . GEA-5332 **High speed . . GEA-5426**
Control . . GEC-505



PROTECT YOUR SAVINGS WITH G-E SYNCHRONOUS MOTOR CONTROL

New rotor field circuit provides accurate field application—motor is protected against starting shock.

New rotor field circuit keeps constant check on motor performance and, on pull-out, field is removed before first slip cycle is completed—to protect against electrical and mechanical damage.

In addition to the protection offered by the new rotor field circuit, the **new, smaller air-break Limitamp controller** provides fast-acting EJ-2 Fuses that limit short circuits to less than one-half cycle for motors up to 5000 volts.

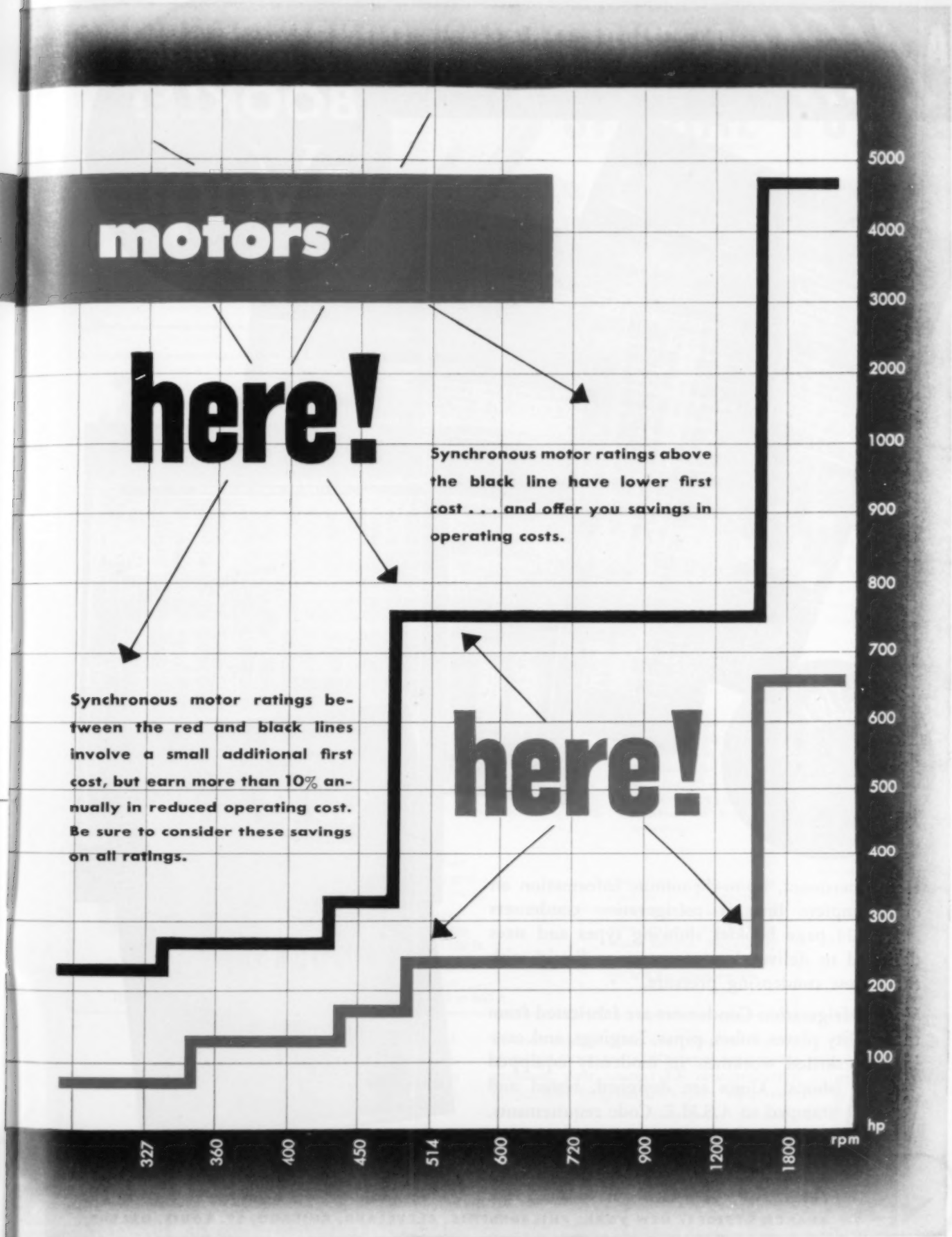
Low-voltage motors (up to 600 volts) are protected by compact, easily inspected air-circuit breakers.

To make it easier to install, to adjust, to operate, and to service, G-E synchronous control is factory-mounted in a steel enclosure with anti-glare meters and all the built-in accessories required for your application.

Come to General Electric for the engineering and manufacturing that will assure you of adequate protection of your motor and plant investment. Write for more information on this precise motor control.

GENERAL ELECTRIC

770-17


motors
here!
Synchronous motor ratings above the black line have lower first cost . . . and offer you savings in operating costs.
Synchronous motor ratings between the red and black lines involve a small additional first cost, but earn more than 10% annually in reduced operating cost. Be sure to consider these savings on all ratings.
here!
5000
4000
3000
2000
1000
900
800
700
600
500
400
300
200
100
hp
327
360
400
450
514
600
720
900
1200
1800
rpm

A NEW REFRIGERATION CONDENSERS BOOKLET BY Vogt

Write FOR BULLETIN RC-1

Here's pertinent, up-to-the-minute information on our complete line of refrigeration condensers . . . a 24 page booklet showing types and sizes designed to deliver low temperature liquid with the lowest condensing pressure.

Vogt Refrigeration Condensers are fabricated from top quality plates, tubes, pipes, forgings, and castings by skilled workmen in modernly equipped shops. Units are designed, tested and stamped to A.S.M.E. Code requirements.

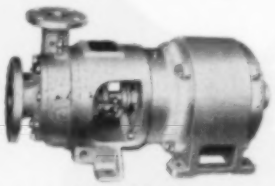
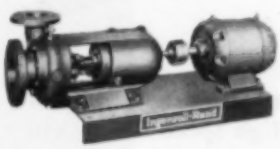
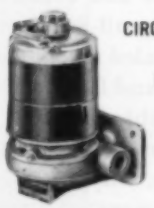
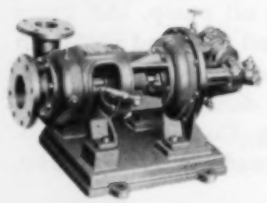
Vogt FOR BETTER REFRIGERATION

HENRY VOGT MACHINE CO., LOUISVILLE 10, KY.

BRANCH OFFICES: NEW YORK, PHILADELPHIA, CLEVELAND, CHICAGO, ST. LOUIS, DALLAS

Do you need a SPECIAL PUMP?

No matter how special your requirements, you may get exactly what you want, from ¼ to 40 hp, from this complete line of Ingersoll-Rand Motorpumps:

	HEAVY DUTY	STANDARD DUTY		MODIFICATIONS
 MOTORPUMPS	Single Stage 10 to 1800 gpm Heads to 240 ft. Two Stage 20 to 275 gpm Heads to 500 ft.	Single Stage 5 to 250 gpm Heads to 175 ft. Two Stage 5 to 55 gpm Heads to 300 ft. Four Stage 5 to 50 gpm Heads 300 to 600 ft.	Can be supplied with any desired type of direct-connected motor – single or polyphase, a-c or d-c; open, splash-proof, totally enclosed fan cooled, explosion proof or marine type.	Open impellers for handling liquids containing suspended material are available on most sizes of Motorpumps and Cradle-Mounted Pumps. To avoid leakage under unusual conditions, Cameron mechanical shaft seals, smothering type glands, or Merco - Nordstrom grease seals can be supplied. Casings and impellers can be built of special materials where required.
 CRADLE-MOUNTED PUMPS	Single Stage 10 to 1800 gpm Heads to 240 ft. Two Stage 20 to 275 gpm Heads to 500 ft.	Single Stage 5 to 250 gpm Heads to 175 ft. Two Stage 5 to 55 gpm Heads to 300 ft.	Can be supplied with any type of motor (as above) – direct-coupled, gear driven, or V-belt driven. Also available with steam turbine or gasoline engine drive.	
 CIRCULATING AND COOLANT PUMPS	Single Stage 5 to 150 gpm Heads to 125 ft.		Available in three types; 1) Immersion type (pump submerged in liquid) 2) External type, with side-wall mounting bracket 3) External type with bracket for horizontal mounting	
 TURBINE-DRIVEN PUMPS	Single Stage 5 to 1800 gpm Heads to 240 ft. Two Stage 5 to 275 gpm Heads to 500 ft. Four Stage 5 to 50 gpm Heads 300 to 600 ft.		Centrifugal pump element same as in Motorpumps – but direct-connected to a velocity stage, impulse type, steam turbine. Particularly applicable to refinery, process and gas plant service.	

These standard I-R Motorpumps are available for prompt delivery—from the factory, or from nearby District Office stocks. Even your so-called "special" requirements can be met quickly from our complete line of standard pump parts. Whatever your pump problem, your nearest I-R representative is qualified to give you expert assistance.

THE CAMERON MOTOR PUMP

A PRODUCT OF

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 472-9

COMPRESSORS · AIR TOOLS · ROCK DRILLS · TURBO BLOWERS · CONDENSERS · CENTRIFUGAL PUMPS · OIL AND GAS ENGINES

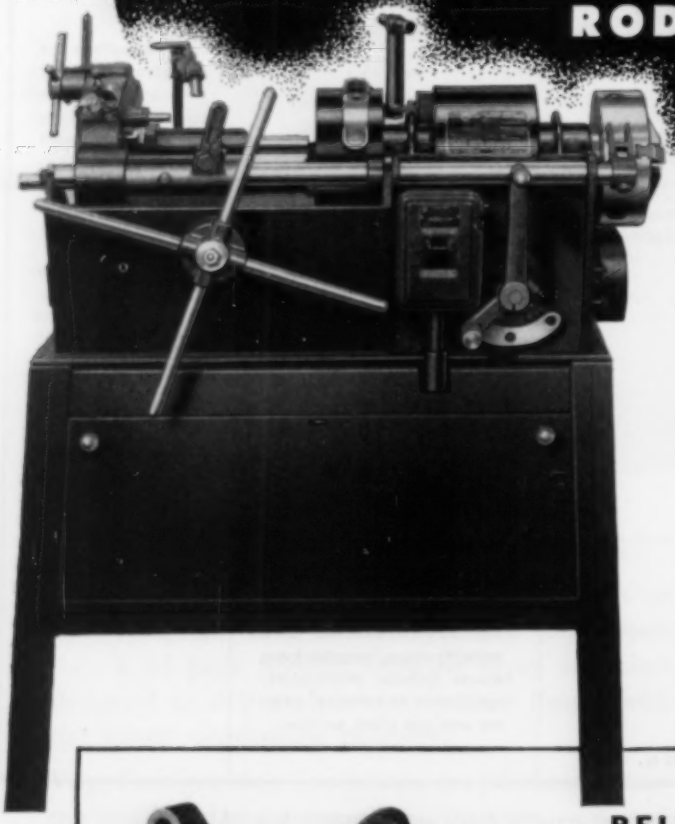
Keep 'em Drilling

AT MINIMUM COST!

thread your drill rod

ON THE JOB

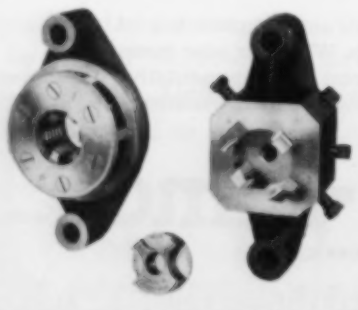
with a **TOLEDO** ROCK DRILL ROD MACHINE



Keep your drill rod in service *at minimum cost*—use a TOLEDO 2″ High Speed Rock Drill Machine! Will thread new or re-thread broken drill rod *right on the job*—at a fraction of the cost of a new rod. Reduces downtime and expense.

Can be tooled to produce Ingersoll-Rand and Timken threads. After rod is annealed the Toledo Machine will turn to size, thread and face off end of rod to a perfect fit for detachable bits.

Sturdy, proven design . . . simple operation. Multiple disc clutch. Chain drive, fully enclosed. Two chucks. Round renewable ways. All steel construction. Centrifugal oil pump. All gears run in oil bath. Segmental dies and tools can be reground for additional service when dull. Send today for complete details. The Toledo Pipe Threading Machine Co., Toledo Ohio. New York Office: 165 Broadway, Room 1310.



Die head and dies, tool box and cutters for turning and forming Timken rods, and special stop for setting the cutters to size are shown here.

RELY ON THE LEADER

TOLEDO

for ROCK DRILL ROD MACHINES

IN ANYBODY'S LANGUAGE-

Bethlehem Wire Rope Means Low Cost Per Unit of Work

In country after country all over the world Bethlehem wire rope has consistently proved its basic economy. Reason: its long life in service, which means low cost per unit of work—the only *true* yardstick of rope costs.

Every wire rope will do a certain amount of work, and it is often possible to record this in terms of definite units. That is, throughout its life the rope will move so many cubic yards of rock, or haul so many loaded cars up a hill, or lift and lower so many tons of drill pipe through varying distances, etc. Obviously, the rope cost should not be measured by purchase price alone, but by the cost of each unit of service the rope gives you.

In other words, the rope with the low price tag may look like a bargain, yet render such limited service that the cost per unit of work is high. On the other hand, a quality rope—costing more at the time of purchase, perhaps—can be a *real* bargain because of the long-term, efficient job it does.

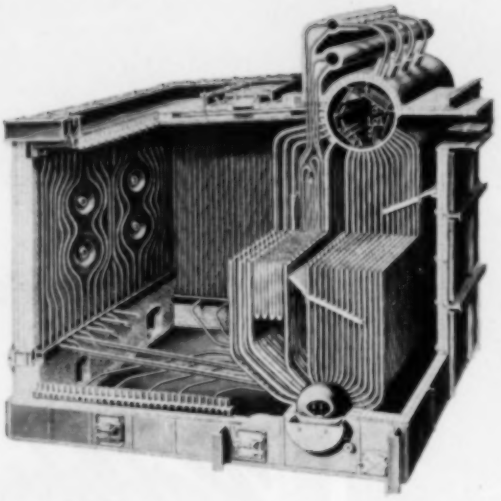
Bethlehem wire rope is a quality product, made by craftsmen in one of the world's finest mills. It is built to give the user *low* cost per unit of work . . . to give him his money's worth and more. You can buy it with confidence; use it with the knowledge that it will serve you long and well.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

C-E Vertical-Unit Boiler, Type VU-50

The Unit shown at the right is but one of a family designed to serve virtually every industrial requirement from about 10,000 to 300,000 (or more) lb of steam per hour, pressures up to 1000 psi and steam temperatures to 900 F. There are Vertical-Unit Boilers suitable for all methods of firing, including pulverized coal, all types of stokers and oil or gas.



C-E Vertical-Unit Boilers

today's best answer to high steam costs

Modern steam generating equipment can't lower the price of a ton of coal or a barrel of oil, but it can produce more steam from every ton of coal or every barrel of oil. The modern unit can't lower the cost of a man-hour but it can and does operate so reliably that maintenance is kept at a minimum.

C-E Vertical-Unit Boilers represent truly modern standards of design. To an exceptional degree they incorporate all the important advances in steam generation made in the past twenty-five years . . . advances that have resulted in substantially increased efficiencies and lower operating costs. At today's high costs of fuel and labor, these gains in operating efficiency may well prove the difference that will make replacement a profitable procedure for you. Whether you have under consideration the purchase of equipment for replacement or expansion, or for a new plant, a C-E Vertical-Unit Boiler will provide the right answer to your particular situation.

The unit illustrated above – and others in the Vertical-Unit line not shown are collectively designed to serve virtually every industrial requirement from about 10,000 to 300,000 (or more) lb of steam per hour, pressure up to 1,000 psi and steam temperatures to 900 F. The entire Vertical-Unit line offers the advantages of time-tested standards of design coupled with that flexibility of application – fuels, firing methods, operating conditions, etc. – required to meet particular plant needs. We shall be pleased to supply catalogs and any additional information required upon request.

B-371-B

COMBUSTION ENGINEERING–SUPERHEATER, INC.

200 Madison Avenue · New York 16, N.Y.

Air hose with cover and tube of NEOPRENE built for trouble-free service in machine shops

Shops and factories are no place for air hose that can't take it—operating conditions are rough! But here's a hose you can depend on for long, dependable service *anywhere*. It's protected inside and out with durable neoprene.

The cover of neoprene withstands exposure to sunlight, ozone, heat and oil . . . doesn't crack or soften. It remains tough and durable—resists abrasion and cutting—continues to protect the fabric reinforcement long after these conditions have weakened on ordinary rubber hose cover to the point where it fails.

The neoprene tube won't disintegrate when exposed to lubricating oil. So no crumbled particles or chunks will be carried along to clog tools. Neoprene resists oil and heat, remains tough, delivers long, leak-proof service.

So for minimum maintenance costs, and maximum efficient, trouble-free service, ask your supplier for quality air hose made with tube and cover of Du Pont neoprene. E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division, Wilmington 98, Delaware.

NEOPRENE PREVENTS TROUBLE LIKE THIS!

Particles of ordinary rubber have disintegrated from oil and heat and clogged the strainer of this filter. The result is a shutdown, and shortened service life of the air hose.

NEOPRENE

The rubber made by Du Pont since 1932

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

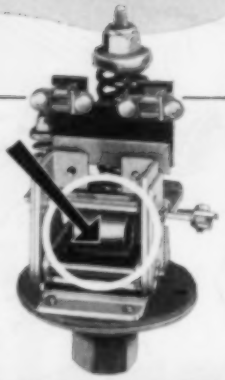
Pressure Switch

FOR **AIR COMPRESSORS** AND **WATER PUMPS**

CLASS
9013 • TYPES GHG and GSG

"POWER HOUSE"
Snap-Action Spring

provides powerful contact snap action and complete valve opening with air compressor switches at all ranges of operation—40 lbs. through 200 lbs. P.S.I.

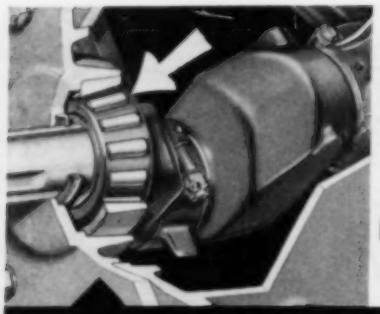


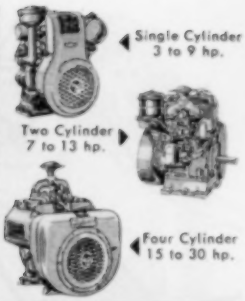
Write for Bulletin **9013-G**

Square D Company, 4041 N. Richards St.
Milwaukee 12, Wisconsin

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES





Why WISCONSIN
HEAVY-DUTY *Air-Cooled* ENGINES
Run on Timken Tapered Roller Bearings

1. Tapered Roller Bearings at BOTH ends of the crankshaft take up *End Thrusts* and *Radial Loads* (impossible with other types of bearings). You can mount your drive directly on the extended crankshaft of any Wisconsin Engine without the need for special thrust bearings.

2. Tapered Roller Bearings *resist* wear to a greater extent than other types not only because of their file-hard alloy steel surfaces, but also because these bearings are inherently SELF-CLEANING.

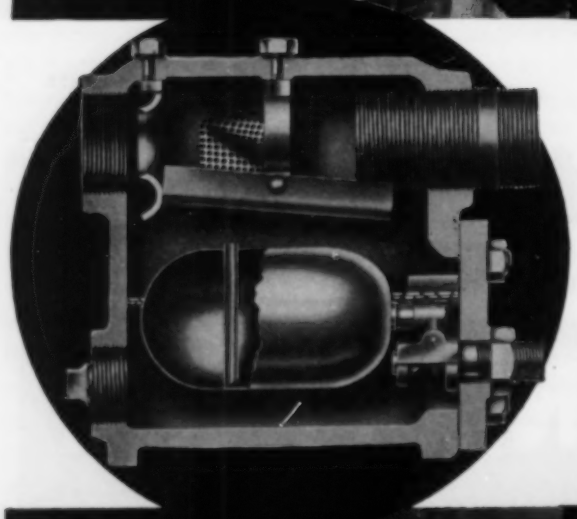
3. Tapered Roller Bearings permit flexing of the crankshaft to a much greater degree than the longer, rigid plain bearings, without danger of developing "bell-mouthed" wobble. We have yet to hear of a single case of Wisconsin Engine bearing failure.

The use of Tapered Roller Bearings in ALL Wisconsin Engines from the smallest to the largest . . . 3 to 30 hp., single cylinder, 2-cylinder and 4-cylinder . . . is typical of the engineering diligence devoted to providing the user with "Most H. P. Hours of on-the-job service".

WISCONSIN MOTOR CORPORATION
World's Largest Builders of Heavy-Duty Air-Cooled Engines
MILWAUKEE 14, WISCONSIN

DRI AIR MAY BE INSTALLED BY SUSPENDING IT FROM THE PIPING WITHOUT ANY OTHER SUPPORT.

INCREASED PNEUMATIC EFFICIENCY WITH THIS AUTOMATIC SEPARATOR



PROTECT EQUIPMENT WITH

DRIAIR

SEPARATES • COLLECTS • DELIVERS

• DriAir separates and automatically ejects the condensed water and oil from compressed air lines, collects pipe scale and rust, delivers clean dry air to tools and other pneumatic equipment. This promotes better lubrication, reduces wear, increases life of tools and produces greater output. All internal parts are made of bronze or copper—resistant to corrosion and practically permanent.

A TYPICAL INSTALLATION SHOWING DRI AIR STANDING ON A CONCRETE FLOOR NEXT TO THE WALL.

WRITE FOR BULLETIN DA WHICH FULLY DESCRIBES THE CONSTRUCTION AND OPERATION OF THE DRIAIR.

NEW JERSEY METER CO.

"SPECIALISTS IN COMPRESSED AIR DEVICES"

PLAINFIELD, NEW JERSEY

HERE'S MOTOR REPAIR SERVICE

THAT WILL SAVE YOU MONEY!

A-C Certified Service Shops, like Cincinnati Electric Equipment Company shown, have modern equipment and expert personnel for fast emergency service . . . for routine maintenance and repair that keeps your production rolling smoothly.

WHEREVER YOU ARE, there is a nearby Allis-Chalmers Certified Service Shop to keep your motors and other electrical equipment running smoothly. These independent shops are selected after careful investigation for their up-to-date equipment, experienced personnel, good business practices and will to serve. They use only factory-approved parts and methods.

When you need repairs or maintenance on motors and other electrical equipment, depend on Allis-Chalmers Certified Service. Write for a list of the Certified Service Shops near you.

For New Motors and Control . . .

No one knows more about correct motor and starter application than your A-C Certified Service Shop. When you need new motors or starters, check with the one in your area or with your nearest A-C Sales Office.

ALLIS-CHALMERS, 1000A SO. 70 ST. MILWAUKEE, WIS. A-2935

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

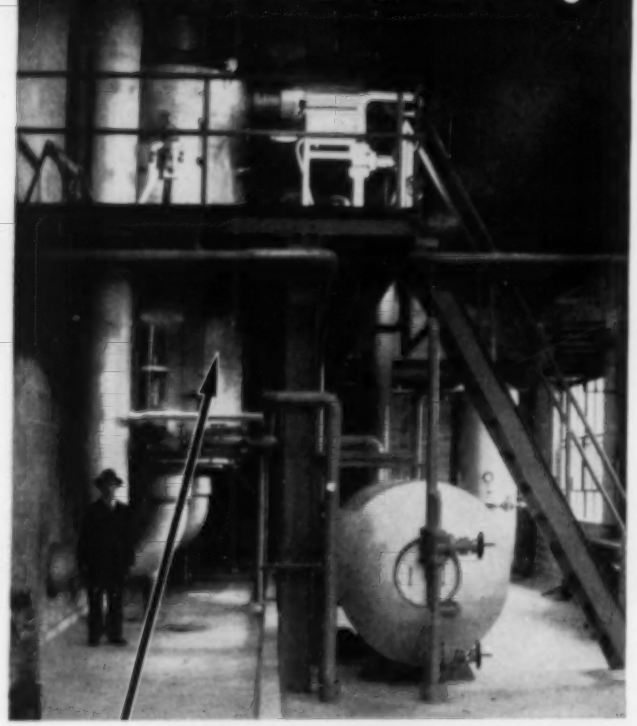
TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

TURN WASTE EXHAUST HEAT INTO INCOME!



MAXIM HEAT RECOVERY SILENCERS

produce steam for plant heating and for sale to nearby customers

Close-up view showing two BVS Heat Recovery Silencers at New Prague; accumulator tank in left foreground.

The municipal power plant at New Prague, Minnesota makes good use of Maxim Heat Recovery Silencers. Waste exhaust heat that would normally go up the flue is used as it passes through the heat recovery silencers to produce usable and salable steam. The steam in this case is used for heating the plant itself, and surplus is sold for heating nearby homes, stores, and a factory.

Thus the New Prague municipal plant achieves effective and very necessary silencing of exhaust noise, but makes this silencing pay for itself many times over.

More and more industrial users, long accustomed to the necessity of effective silencing, are now realizing the profit possibilities of installing heat recovery silencers to produce steam for heating or processing operations, and without any extra fuel cost.

THE MAXIM SILENCER COMPANY

61 HOMESTEAD AVE. HARTFORD 1, CONNECTICUT

Please send bulletin on silencers for;

☐ Heat Recovery ☐ Intake

☐ Exhaust ☐ Spark Arrestors

Name _____

Company _____

Address _____

BE SURE IT'S A

MAXIM

AIR-MAZING FACTS

UP IN SMOKE! Two million tons of dust and soot are discharged into New York City's air every year from furnace fires and other types of combustion.

FAZED BY HAZE? Electromaze electric air filters clear the air of dust, pollen—even smoke—by trapping particles as small as 1/250,000 of an inch. "File drawer" design makes Electromaze easier to clean, easier to fit and install.

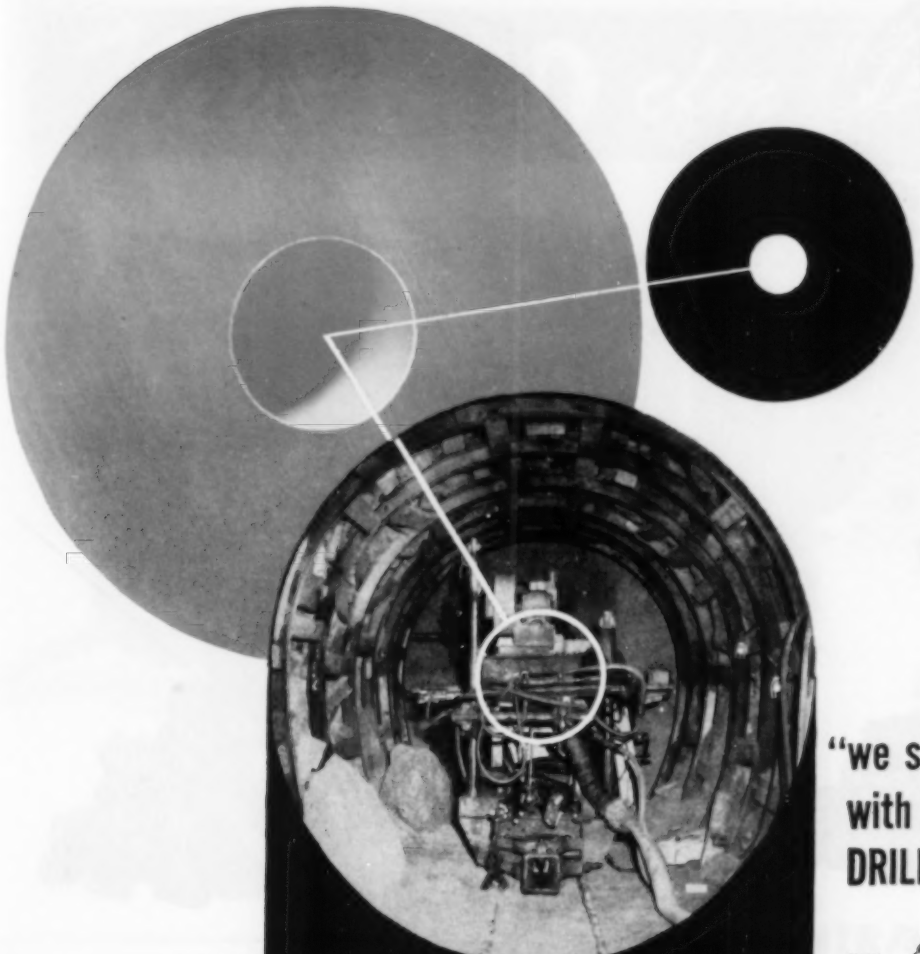
DROWNS DIRT! Air-Maze oil bath air filters trap dirt in a pool of oil, protect engines and compressors. It's one of hundreds of filter types designed by Air-Maze, *the filter engineers.*

WHETHER YOU BUILD or use engines, compressors, air conditioning and ventilating equipment, or *any device using air or liquids*—the chances are there is an Air-Maze filter *engineered* to serve you better. Representatives in all principal cities, or write Air-Maze Corporation, Cleveland 5, Ohio.

AIR-MAZE

The Filter Engineers

AIR FILTERS
SILENCERS
SPARK ARRESTERS
LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS



Check this tabulation of Owens' drilling for a 31-day period:

	Previous Record	Owens' Tunnel Record
Total footage	1879	2442
Average footage/day	61	7877
Best footage/24 hrs.	81	104
Best footage/8 hrs.	28	41

"we set three world records with CRUCIBLE HOLLOW DRILL STEEL!"

says George W. Foster Supt.
Owens Tunnel Contractors

George Foster and his crew have established three enviable drilling records. Working on three tunnels, each 10,000 feet, for the Los Angeles Department of Water and Power . . . Mr. Foster's tunnel specialists have drilled 4100 feet in tunnel #1; 4300 feet in #2; and 5000 feet in #3. Throughout this record-breaking operation, Crucible Hollow Drill Steel 1⅛" round is used exclusively.

Setting records like these takes men and tools that can stand up and take the punishment of around-the-clock operation. *Pre-tested* Crucible Hollow Drill Steels are built to give rugged service even under the most severe field operations. *Every lot* of Crucible Hollow Drill Steel is backed by Crucible's half century of specialty steel experience. Our metallurgists can help you with your drill steel problems. Write us stating full details. CRUCIBLE STEEL CO. OF AMERICA, Chrysler Building, New York 17, N. Y.

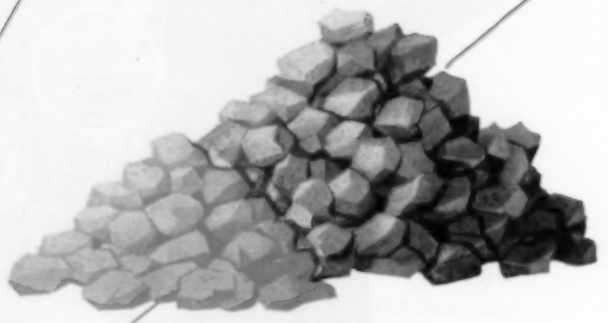
CRUCIBLE first name in special purpose steels

HOLLOW DRILL STEEL

HIGH SPEED • TOOL • STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE • STEELS

GREATER SAVINGS

BETTER BREAKAGE



MORE PRODUCTION

FOR LOWER BLASTING COSTS

You can save three ways by replacing older-type explosives with "Gelamites" and "Hercomites." These Hercules explosives give better breakage, greater production, and are more economical to use than extra dynamites and gelatins. Both "Hercomites" and "Gelamites" come in handy "Tamptite" cartridges. For further information, write for our illustrated booklet "Hercomites and Gelamites for Lower Blasting Costs."

HERCULES POWDER COMPANY
INCORPORATED
932 King Street, Wilmington 99, Delaware

"GELAMITE," "HERCOMITE" AND "TAMPTITE" ARE REG. U. S. PAT. OFF.

XR50-6

New 500 cfm

Ingersoll-Rand MOBIL-AIR AIR POWER

the IKA-500 with the UD-24 International-Harvester Diesel Engine

...the latest addition to the IR CONTRACTORS' COMBINATION *

Easy-Starting International-Harvester Diesel Engine ... Starts as a gasoline engine and, by means of a single lever, is switched to full-diesel operation.

Floating-Speed "Drill-More" Regulator .... saves up to 40% in fuel and allows air tools to do 30% more work by maintaining 15- to 20-psi higher average air pressure. This new regulator holds the rated pressure of 100 psi at full compressor capacity.

Other Sup-IR-features... Self-adjusting Hydro-Shift Flex-Disc Clutch... Two-Stage Air-Cooled Compressor with Channel Valves and Piston-Type Free-Air Unloaders... extra strong frame and running gear.

Now you can get Ingersoll-Rand's famous 500-cfm Mobil-Air Compressor with the well-known International-Harvester UD-24 full diesel engine. Ruggedness, dependability and economical operation are combined in this new Air Power unit. It is made to order for wagon-drill work on dams, tunnels and other big jobs requiring a lot of air continuously at full pressure.

The UD-24 diesel provides sufficient reserve power to assure full compressor capacity at rated pressure under these heavy loads even with widely varying weather and altitude conditions.

This new Mobil-Air will operate two Ingersoll-Rand FM-2 Heavy Wagon Drills or five I-R Wagonjacks. Under a smaller air tool load the IKA-500 will operate as economically as a smaller portable because the Drill-More "Floating-Speed" Regulator automatically slows down the compressor to the exact speed needed.

Here's the big portable you have been looking for. Ask your Mobil-Air distributor for more information, or write or phone your nearest Ingersoll-Rand branch office.

*

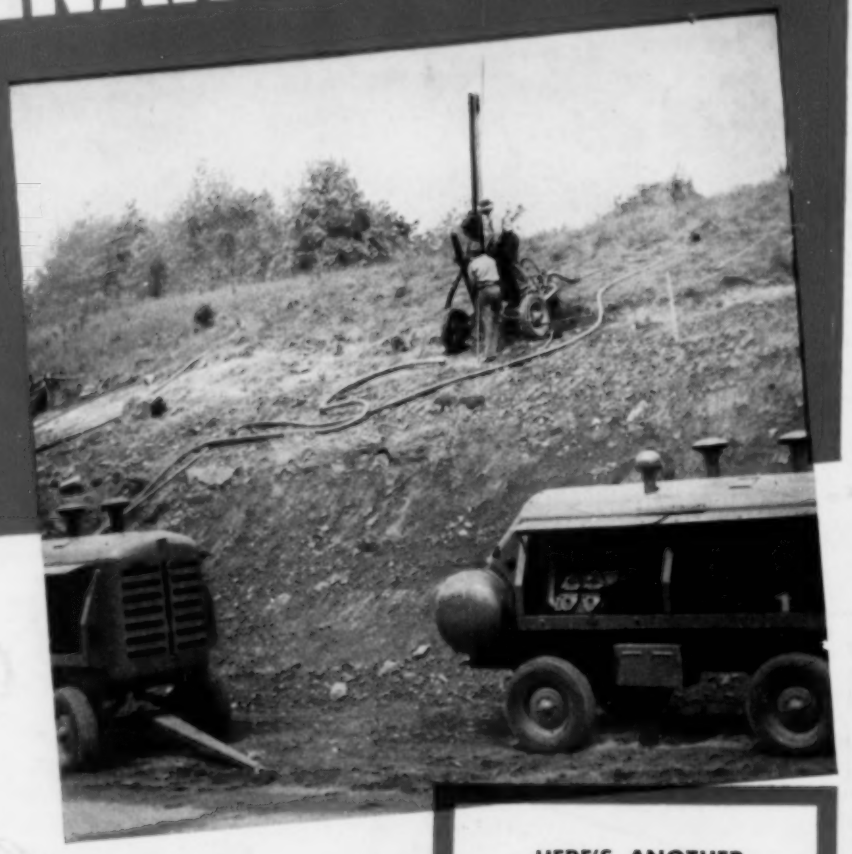
- *Everything you need for rock drilling.*
- *Top quality machines that work as a team.*
- *Machines designed, built, sold and serviced by men who know rock excavation ... application "know how"*

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 483-2

REDUCE COMPRESSOR MAINTENANCE COSTS

Use the Texaco air compressor oils exactly suited to your particular operating conditions



TO RUN your air compressors at top efficiency and bring your maintenance costs down, select lubricants to meet the specific operating conditions. You can do this with Texaco because there is *a complete line* of Texaco air compressor oils to meet every need.

For example, if conditions are normal, your Texaco Lubrication Engineer will recommend Texaco straight mineral oils; but if excess moisture is present, he will suggest a Texaco compounded oil. Then for rust prevention, there are special Texaco rust-inhibited oils . . . and for very heavy service, or where carbon and gum formation are problems, Texaco heavy-duty oils should be used.

Use of the *right* Texaco air compressor oils assures smooth, trouble-free operation and reduces wear. Your compressors will run with free rings, cleaner valves, open ports . . . air lines will stay clear.

Get the full story from your Texaco Lubrication Engineer. Just call the nearest of the more than 2,000 Texaco Wholesale Distributing Plants in the 48 States or write The Texas Company, 135 East 42nd Street, New York 17, New York.

HERE'S ANOTHER TEXACO ECONOMY

You'll drill greater footage at lower cost when you lubricate drills with *Texaco Rock Drill Lubricants EP*. These are "extreme pressure" lubricants . . . designed to assure full protection against wear, to guard against rust, and to prolong drill life.

TEXACO

TEXACO Air Compressor Oils

FOR ALL OPERATING CONDITIONS

TUNE IN . . . TEXACO presents MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA radio broadcasts every Saturday afternoon.